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CONTENTS

	<i>Page</i>
Sociological aspects of aging <i>Howard E. Jensen</i>	569
Priorities in public health nursing <i>Margaret G. Arnstein</i>	577
Budgeting a combined health department <i>A. D. Sidio and John S. Anderson</i>	582
Health problems of American seamen as measured by hospital statistics <i>Robert W. Barclay and Edythe A. Gray</i>	585
Association of bats with histoplasmosis <i>Chester W. Emmons</i>	590
Decreasing radiation in photofluorography <i>Edward L. Ernsberger</i>	596
Serologic studies of staphylococcal enterotoxin <i>E. P. Casman</i>	599
Followup of blastomycin sensitivity in an epidemic area . . . <i>J. Graham Smith, Jr., Walter C. Humbert, and Sidney Olansky</i>	610
Institute of Agricultural Medicine in Iowa <i>Richard A. Tjalma</i>	615

Continued ►



frontispiece

Papers on public health nursing appear on pages 577 and 627.

CONTENTS *continued*

A health department's activities in mental health.....	619
<i>H. L. Blum and W. A. Ketterer</i>	
Public health nursing service provided in households.....	627
<i>Marion Ferguson and Mary Ellen Patno</i>	
Status of controlled fluoridation in the United States, 1945-57.....	634
Poliomyelitis in Idaho after use of live virus vaccine.....	637
<i>Carl M. Eklund, E. John Bell, and Robert K. Gerloff</i>	
Appraising scientists and their jobs.....	648
<i>Richard W. Bunch</i>	
Evaluating a rehabilitation program for post-hospital mental patients.....	650
<i>Henry J. Meyer and Edgar F. Borgatta</i>	
An epidemic of enteritis laid to cross-connection.....	658
<i>Floyd M. Miller and Ben Freedman</i>	
Short reports and announcements:	
PHS staff appointments.....	576
U. S. injury estimates, July-December 1957.....	581
Cerebrovascular diseases classified.....	595
International mail pouch.....	598
John K. Hoskins, 1884-1958.....	609
Training in the care of prematures.....	614
Perrott retires.....	618
Course in laboratory methods in TB diagnosis.....	626
Radioactivity study.....	633
U. S. medical supply stocks surveyed.....	647
Research grant for National Library of Medicine.....	649
Use of plastic trays in the CF test. Technique.....	656
Publications.....	662

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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55

More people are attaining advanced age. Will social science help them to enjoy it? What roles are the aged to perform for their satisfaction? And how are cultural values to be adjusted to provide proper appreciation for such roles?

Sociological Aspects of Aging

HOWARD E. JENSEN, Ph.D.

THE biological and sociological problems of aging, although complementary, are quite disparate. Biological research on the progressive changes taking place in the aging organism deals with objective anatomical and physiological phenomena directly measurable by physically standardized instruments. Sociological investigation of the interrelationships of the aging organism and the sociocultural environment, on the other hand, is concerned with covert or subjective attitudes and values that are only indirectly measurable by instruments. These, in turn, involve various culturally conditioned judgments in their construction, and require constant revision and restandardization with advances in theory and changes in cultural value systems, if they are commensurable at all.

Furthermore, as we pass from the biological to the sociological investigation of aging, the locus of research shifts from the more static conditions of the laboratory and clinic to the more dynamic settings of fieldwork where scientific controls are at best crude, and often

impossible. In no field is it more difficult to transmute the particularities of individual case study into the generalities of statistical analysis.

Again, unlike biological systems, human social systems are structured not by the genetically determined reaction patterns of the biological units that compose them, but by behavior patterns invented and acquired in social interaction. These socially derived patterns constitute the systems of cultural values which determine the social structure of human groups. Such structures do not age and die. They either commit suicide by man's inability to devise new patterns capable of dealing with the problems generated from within, or they are murdered by his inability to repel conquest from without. A social system is simply the blueprint according to which interpersonal and social functions have occurred in the past, are occurring in the present, and may be predicted to recur in the future.

Therefore, the aging of an individual, as a sociocultural phenomenon, is defined not by physical deterioration or by time but by the value system of his society. A person is sociologically old when he is so regarded and treated by his socii. The problems of personal and social adjustment confronting the aged are the resultants of the role and status accorded them by the group, the social provisions for their continuing prestige and security, and the opportunities afforded them to achieve these ends by their own initiative.

*Dr. Jensen was chairman of the department of sociology and anthropology, Duke University, Durham, N. C., when his paper, on which this one is based, was delivered before the Duke University Council on Gerontology at a seminar on April 2, 1957. He is now professor emeritus of sociology. The full paper was published in *Proceedings of Seminars, 1956-57*, edited by F. C. Jeffers, A. H. Edens, and E. W. Busse, November 1957.*

There is neither time nor need to survey the widely divergent perspective of aging in various social milieus. Those interested in pursuing this subject further may well begin with Simmons (1) and Eisenstadt (2). Suffice it to say that universally these varying perspectives are the result of the interplay of automatic and impersonal physical, biological, and social forces on the one hand and conscious and purposive personal and social efforts on the other. Sociological interest focuses upon this interplay in all cultures.

The aging populations of all cultures experience similar physiological changes that manifest themselves overtly in deterioration of physical and ultimately of mental capacities. Universal, too, are the probabilities of bereavement by the death of one's mate, especially for women. For the greater longevity of women, insofar as comparative data are available, seems to be a phenomenon common to all cultures.

Changes in physical activities are everywhere precipitated by these overt manifestations. But sociological interest in the problem of aging does not focus, as does the biological interest, upon the objective measurement of these changes. Instead, it focuses upon the investigation of the cultural value systems that define these changes in role and status, and upon the meaning of these changes to the aging persons themselves and to their contemporaries.

Problems of Aging

Sociologically considered, the problem of aging in contemporary western culture is a new phenomenon in human history in at least four ways. Two of these, the increasing number of the aged and the extension of the time during which they enjoy (or suffer) that status, are too well known to require more than passing mention.

Two other circumstances have so completely changed the sociological character of the problem that it is hardly an exaggeration to say that prior to their emergence the problem did not exist. These are the abruptness of the social transition from productivity to retirement and the loss of role and status that accompanies it.

In the simpler cultures, as well as in our own until the last 2 or 3 generations, the gradualness of the physiological changes was paralleled by

a corresponding gradualness in the change of social functions, which permitted a smooth transition and a gradual adjustment to the new functions by both the aged and their younger contemporaries.

Again, in the simpler societies and in traditionally oriented cultures like our own until recently, the aged, as a general rule, usually suffered no such loss of role and depreciation of status as is the fate of the majority in our highly developed technological civilization.

In every society, aging is accompanied by changes in the active roles played by the aged and in the functional categories to which they belong. In the simpler societies and in cultures oriented to tradition, role and status are usually ascribed rather than achieved. That is, the functions to be performed by the person are determined by characteristics over which he has no control, among the more important of which are family lineage, sex, and age. When roles are age-graded the person acquires the status assigned to his role. One knows precisely what changes of role will be expected of him and what rank will be accorded him as he passes from one age grade to another. This transition is so gradual, and the social conditions under which it takes place so stable, as to permit the value systems of the culture to be effectively internalized in the character of the person. Thus, a fair degree of harmony between the expectations of the person and the requirements of the group is maintained.

But in a society based on applied science and technology, both role and status are achieved rather than ascribed. The role is determined by the individual's capacity to perform the functions required, and status by the evaluation placed by the group upon the role performed. In such a society role and status are conjoined. Status is thus linked with the role rather than with the person performing it, so that when the role is no longer performed, the status tends to deteriorate.

Tradition and Status

In societies with ascribed status there are at least six distinct roles ascribed to the aged that give them a recognized and assured social position:

First, the aged are the preservers and disseminators of the knowledge of the group. They are its library as well as its teachers, for the sacred lore is stored only in their memories. As a Yoruba proverb states it, "A man may be born to fortune, but wisdom comes only with length of days."

Second, by virtue of this monopoly the aged hold a strategic position in deciding the policies of the group. The maxim, "Old men for council, young men for war," is practically universal in traditionally oriented societies.

Third, and closely associated with the foregoing, are the rights and privileges associated with parental authority and the ownership and management of family property. These prerogatives may persist long after death through the sacred and binding character often accorded by the culture to the dying wishes of family heads with regard to property and other matters within their jurisdiction.

Fourth, the aged are often the magicians, witch doctors, priests, and seers as well as the sages of the group. This role also frequently survives death through the prevalence of ancestor worship and fear of ghosts.

Fifth, they possess the experience and skill required to supervise the industrial and decorative arts.

All these are roles that require little physical strength or stamina. They can be performed as long as accurate memory, sound judgment, and social skill in managing interpersonal relationships continue. They are also highly honorific roles whose prestige usually outlives the person's capacity to perform them and gives to age as such a respect and dignity that redounds to the benefit of less competent contemporaries.

For the latter there remains a sixth role. The lighter auxiliary tasks of field and herd, of hearth and household fall to their hands. By these activities they release mature adults of both sexes for more strenuous work and so maintain their status as participants in the common life.

Technology and Status

All of these roles have played a significant part in the history of our own culture. Some

of them have been abolished by the processes of social change, and those that survive have been greatly reduced in significance. The monopoly of wisdom and knowledge began to weaken with the invention of writing, and has finally been wiped out by universal mass education. The ceremonial role ceased with the passing of magic and the rise of professionally trained religious leaders. The policy-forming role survives only for the higher professional, administrative, and bureaucratic classes, most notably in politics. Finally, the rise of technology has greatly reduced the role of the hand-craftsman and the need for auxiliary services.

Prescribed roles have dwindled as technology has advanced and such functions as remain to the aged are no longer the prerogative of age. In a technological civilization, roles are won in strenuous competition requiring youth and stamina. Status is achieved chiefly through the performance of role, and, for the majority of the aged, status does not long survive its passing.

Older persons of the upper classes of business and professional people who have been successful may continue to be in active demand on a part-time basis or as consultants, and to enjoy an ascribed status after they have relinquished the roles through which status was achieved. But for those of the lower classes, especially the unskilled workers, the loss of their economically productive roles is usually less gradual, less voluntary and reversible, and they enjoy no such halo effects of past achievement. They are suddenly precipitated into a situation where they lose their financial independence, their capacity to make their own decisions, and, what is worse, the esteem of their fellows and their own self-respect.

But new technological changes now in process may have some effect in reversing this trend, as an increasing percentage of the gainfully employed is now being absorbed into professional, technical, clerical, and other more honorific pursuits and a decreasing percentage into the more arduous and unskilled occupations.

For humanistically inclined researchers, the biological objective of gerontology is to make old age attainable; the sociological objective is to make it satisfying. Medical progress has increased the proportion of the aged; technological progress has reduced the proportion of

meaningful roles available to them, and the cultural lag in the social sciences leaves us as yet inadequately equipped to deal with the resultant problems of personal and social adjustment.

For social research, the fundamental problem is to discover and investigate the social—not the physical—barriers that limit the aged in the pursuit of satisfying goals. For applied sociology, the problem is to devise techniques to remove or reduce these barriers, or, at least, to compensate for them. Techniques must also be developed to help aging people to gain insight into and to adjust to the changing biological, social, and cultural conditions that confront them.

Although these social barriers are generally considered to be a product of urbanization and industrialization, both of the latter are the results of technological changes which began to revolutionize urban life in the 19th century and have now been extended to rural life as well. While it is still true that a rural environment is more suited than an urban one for satisfactory living in the older years, technological changes on the farm are also making successful adjustments more difficult there. In fact, in at least one respect the reaction of the aged to role changes may perhaps be less severe in metropolitan than in less highly urbanized areas, because of a greater degree of anonymity and compartmentalization of roles among urban dwellers, and a consequent lessened effect that the reduction in any one role has upon participation in others.

Social Adjustment

The criterion of social adjustment, for the purpose of this discussion, is the degree to which an individual is able to satisfy his personal needs and to accept the role and status accorded him by the value system of his community.

There are two types of adjustments confronting the individual in relation to his social roles: (a) that normally required by the social category to which the individual belongs, and (b) that resulting from a shift in role from one social category to another, which usually aggravates the attendant problems of adjustment.

The two problems are quite distinct. If, in the course of his life, a man remains in the same role, while other roles which were formerly subjectively rated on a parity with or beneath his own increase in prestige, he suffers a reduction in status, notwithstanding the fact that his role may have remained stationary or actually improved. Studies of role and status that do not penetrate beneath the objective facts to the changing evaluation of the culture and the subjective attitudes felt by those who participate in it have little to contribute to our understanding of human relations in general or aging in particular.

Space does not permit a review of the way in which these problems vary with regional, rural, rural nonfarm, suburban, urban, and metropolitan distribution or with position in the class structure, racial and ethnic origins, voluntary and involuntary retirement, financial ability, occupation, education, religious affiliation, family integration, self-identification with aging, and many other sociocultural factors.

Suffice it to say that there has been little investigation of the more fundamental sociological problems of these categories as evaluated by the community or by the aging persons themselves. Such an objective factor as decline in socioeconomic status, for example, is relatively easy to measure. It is valuable so far as it goes, but it is an inadequate index of the sociological problem of aging. It can only be interpreted in the light of the subjective attitudes of satisfaction or dissatisfaction of the person with his new role and status, and of the equally subjective cultural value system that conditions these changes.

As the research of Burgess has disclosed, even so objective a measure as a count of the activities participated in by the aged correlates but moderately with personal adjustment to aging, from which he concludes that "it is just as important, or even more so [to] get at the subjective reactions" and "self-conceptions of older persons" through their introspective reports of their attitudes and states of feeling as it is to study their objective situations (3).

Furthermore, these questions of attitude have as their correlates corresponding questions of value. To what extent, for example, do conceptions of the self as culturally derived affect

the adjustment of the aged? The available data indicate a significantly higher degree of maladjustment among those who identify themselves as old than among those who are in fact 70 or older. It has also been noted that those under 70 who identify themselves as old show a slightly higher ratio of maladjustment than those 70 and over who identify themselves as middle aged. It would seem, then, that although age identification is a factor in maladjustment, the importance of this factor cannot at present be assessed. The degree to which age identification is influenced by psychological factors resulting from such physiological and social changes as loss of mate or loss of role and status due to physical and mental deterioration is unknown. But one thing is certain, under the prevailing value system of our culture, to identify oneself with the aged is to accept a negative social evaluation of the self.

The simplest part of the sociological problem of aging, then, is to ascertain the objectively determinable physical needs of the aged (chiefly economic security, housing and medical care, and recreational and other leisure-time facilities), and to provide for them.

But knowledge about and suitable provision for the less tangible and more subjective socio-cultural needs present far more difficult problems for both social research and social action. Chief among these are needs associated with the more subjective values of religion, emotional security, personal independence, and social status and role. Among these the religious needs should be the easiest both to determine and to satisfy.

Retirement

The needs for independence and for social role and status present far different and more difficult problems. It is in these questions of social role and status that the sociological problems of gerontology chiefly consist.

Preliminary research, for example, indicates that it is involuntary retirement rather than financial ability per se that is associated with initial adverse reaction to retirement (4). Cavan and associates report that, other social categories being equal, old people who have had a hard life keep their faculties much better and

make a more realistic adjustment than those who have had an easier one (5). Nevertheless, voluntary and enforced retirement show a high correlation respectively with positive and negative attitudes toward that status. Voluntary retirement presents few problems of personal maladjustment in making the transition. But most of those forced into involuntary retirement undergo at least temporary maladjustment. Although financial ability or inability to retire seems to make little difference in the immediate adjustment to retirement, the financially able adjust more quickly than those who are compelled to find or to accept new sources of financial support (6a). The burden of retirement therefore rests most heavily on the lower classes, few of whom are able to retire voluntarily. Lack of regular activity is several times as prevalent here as in the middle and upper classes, and most of them desire to return to work. This is confirmed by the tendency of able-bodied retired workers to return to full employment when the opportunity to do so becomes available. Those who are physically unable to continue at their former occupations would rather transfer to less strenuous jobs with less loss of income than retirement would impose, bitterly as they may resent the loss of status involved. Prevailing cultural evaluations make it difficult for the worker to adjust to a lowering of status within the established hierarchy of employment roles.

There is no substitute for gainful employment for this group, both because of economic need and because their limited range of interests provides little motivation to engage in other forms of satisfying and creative activity. Such persons have little to retire to except retirement, owing to the difficulty of developing new interests and changing old habits. It is for these groups that the day care centers, such as the center sponsored by the New York City Welfare Department, fill an urgent need. Most of the clients of these centers are public welfare recipients, many of whom live alone or are left to themselves while other members of the families with whom they reside are at work. The department reports a notable reduction in the medical care needs of their participating clients, and not one case of hospitalized mental illness among the participants (7).

Three-Generation Family

During the depression, responsible citizens first realized that changes in the social structure of family and community life and in public opinion had been so great as to render our conceptions of family care inadequate. It is difficult, if not impossible, to enforce family law in the traditional three-generation family. The rights of the elders within the family circle stemmed less from the legal obligation of their offspring than from the force of custom and strong feelings of filial obligation. These feelings survive in European culture somewhat more strongly than in our own and are still recognized in the peasant concept of *Ausgedinge* or *Altenteil* (6b). As Mumford has said, "probably at no period and in no culture have the old ever been so completely rejected as in America during the past generation" (8).

It is this loss of role and status within the three-generation family that constitutes the sociological problem of aging. Any program for the aged that does not provide a community substitute for the range of vital interests and socially valuable functions provided by the traditional three-generation family is sociologically unsound. Many current developments in community planning for older people merely aggravate this problem. They provide a segregated community of beauty, order, and convenience, with excellent housing and recreational facilities and physical and medical services. But by congregating their clients (or should I say, their victims) in segregated communities, they further isolate them from normal interests and responsibilities.

No amount of amusements and hobbies, invaluable as they are in individual cases, can provide the savor of reality and the zest for life of normal participation in the activities of a mixed community, and restore to the aged the role and status, the social acceptance and self-respect they formerly enjoyed in the three-generation family at its best. Without these, the finest provisions for housing and physical care can furnish nothing more than a first-class ghetto. As the resident of one such model project complained bitterly, "All we do here is to wait for each other to die. And each time we say, 'Who will be next?' What we want is a

touch of life. I wish we were near shops and the bus station where we could see things" (8). Man is a social being with many nonphysical needs that can be satisfied only by active participation in the common life of his fellows.

We shall not have attained a healthy and socially mature society until we have developed roles for every age category in the community and a social status commensurate with the role performed. Nothing can provide the satisfactions of gainful employment for those able and willing to continue it.

In the increased leisure of those who have successfully adjusted to retirement or semi-retirement there exists a vast potential for public and social service which we have hardly begun to tap. But such voluntary services are little more than busy work unless they are integrated as essential parts of community life. They can provide their participants with a realistic sense of doing something that is important and valuable only if they are regarded by the community as having importance and value. For this group, it is especially important to lift the barriers to employment based on chronological age and to substitute capacity to function.

Prevailing Values as Barriers

An adequate and comprehensive program of social action on behalf of the aging must await the development of a new social philosophy and its incorporation into a new set of folkways and mores with regard to their capacities and needs. Even the limited research now available in these fields is not generally known. Consequently, public opinion and policy lag considerably behind even what we know. This lag is primarily due to the resistance of the prevailing value system with its emphasis on youth, speed, initiative, and inventiveness at the expense of such qualities associated with age as maturity of experience, judgment, skill, and reliability.

Unfortunately, this lag has been in part institutionalized in plans which implement the conviction that it is desirable to retire the older to make room for the younger workers with new ideas and eager for advancement. The accent on youth has found reenforcement in such sentimental slogans as Ellen Key's, "The twentieth century as the century of the child," and more

recently by such sociological fallacies as the famous definition of the family as a group of interacting personalities built up about the child, or the emphasis of child guidance workers upon the parent-child relationship as the most fundamental of human relationships, rather than the husband-wife relationship. For not only is the husband-wife relationship prior in time to the parent-child relationship, and more enduring, but it is a major factor in determining what quality of the parent-child relationship can exist.

Perhaps we are in danger of a corresponding distortion in our philosophy of aging by such verbal legerdemain as "the golden years," and "the best is yet to be." But to those who are experiencing the realities of the departure of children, loss of spouse and friends, impairment of health and vigor, reduction of income, and loss of role and status, there is nothing either golden or good. As one resourceful lady of 72 put it, "When one has given her life to serve others, first children and later other members of the family, and when they are gone and one is all alone—there is no longer any use to live, life has lost its meaning, there is no substitute" (9).

Indeed, such expressions may become occasions of further frustration. For as Cottrell has shown, the degree of adjustment to social roles which society assigns to its categories, including age, varies directly with the clarity with which such roles are defined. Lack of clarity and consequent maladjustment result from any "discrepancies between what is given verbally and what is demonstrated in practice" (10).

A fundamental reorientation in the prevailing value system is required, since the degree of adjustment to any role varies with the consistency with which others respond to one in that role (10).

Fundamental Philosophy

It is entirely proper to take a more optimistic attitude toward old age in general than is now current, but a realistic philosophy will pander to no hopes or sentiments that are incapable of practical realization. It will recognize four basic facts:

First, that there is an irreducible number of

the aged incapacitated for participation in any active program.

Second, that there are large numbers who are capable of sufficient rehabilitation to resume activities outside their homes.

Third, that some of these lack abilities or motivation for participation in activities beyond recreation and entertainment.

Fourth, that for many others there exists an urgent need for discovering and developing economically and socially productive roles offering opportunity for continuing, even if decreasing, individual satisfaction and status in the later years. One of the most distressing aspects of aging is maladjustment from frustration due to a culture that denies roles and status to which the aged are still entitled as a matter of right by their potential contributions to the common life. But the physiological changes of advancing years make changes in social roles ultimately inescapable.

Actions designed to facilitate shifts in roles will require much more extensive and detailed sociological research than is now extant. These must include:

1. The determination of roles appropriate to the disabilities involved.

2. Technical case and group procedures to assist the aging in the process of transition. A realistic understanding of the social worth of the new role must be developed, and the aging must have opportunities to identify themselves with these roles through intimate individual contacts, imaginative practice or dramatization, or actual participation.

3. And most difficult of all, a transvaluation of the prevailing system of values in our culture so that the new roles assumed by the aging may be appreciated. This is an essential basis for any program which the aged themselves can accept as realistic and satisfying.

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PHS Staff Appointments

Dr. James V. Lowry is the new chief of the Bureau of Medical Services, Public Health Service, with the rank of Assistant Surgeon General. Deputy chief of the Bureau since 1957, he succeeds Dr. John W. Cronin, who died in March 1958.

On June 1, 1958, Dr. Arnold B. Kurlander was appointed deputy chief of the Bureau; and on July 1, Dr. John C. Cutler became Assistant Surgeon General (Program Operations) in the Office of the Surgeon General, the post previously held by Dr. Kurlander. Dr. Cutler has been assistant director of the National Institute of Allergy and Infectious Diseases, Public Health Service, since the beginning of 1958.

Dr. Lowry's assignments in the Public Health Service, which he entered in 1937, have covered clinical medicine, research, and medical administration. After serving with the National Institute of Mental Health from 1947 to 1954 with the responsibility for the development of community mental health services, he spent 3 years as medical officer in charge of the Public Health Service Hospital in Lexington, Ky.

Dr. Kurlander, a member of the commissioned corps since 1940, served as tuberculosis control officer in the Arizona and Ohio State Health Departments and was assistant professor of preventive medicine at Ohio State University. He came to Washington, D. C., in 1950 as chief of the State Aid Branch, Division of Tuberculosis, Public Health Service, later becoming assistant chief of the Divi-

sion of Chronic Disease and Tuberculosis, and then chief of the Chronic Disease Program.

Dr. John C. Cutler entered the commissioned corps in 1942. Two early assignments were with the Public Health Service Venereal Disease Research Laboratory at Staten Island, N. Y., and the Pan American Sanitary Bureau for venereal disease research studies in Guatemala.

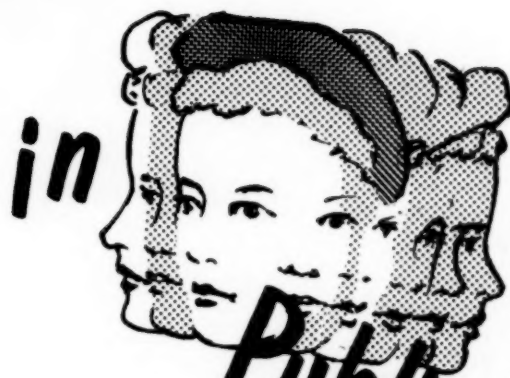
Subsequently, Dr. Cutler was detailed to the World Health Organization to direct a venereal disease control demonstration team in India.

In 1951 Dr. Cutler became chief of the Technical Aids and Services Branch of the Public Health Service Venereal Disease Division, and in 1954, program officer working in planning and evaluation of specific disease control programs in the Office of the Chief, Bureau of State Services. Three years later he was named chief program officer for the Bureau.

M. Allen Pond, who has been on detail from the Public Health Service to the Office of the Secretary of Health, Education, and Welfare since 1953, was given the rank of Assistant Surgeon General on June 15, 1958. Mr. Pond is staff assistant to the special assistant for health and medical affairs in the Office of the Secretary.

Harry G. Hanson, director of the Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio, was promoted to the rank of Assistant Surgeon General on June 1, 1958.

Priorities



Public Health Nursing

MARGARET G. ARNSTEIN, R.N., M.P.H.

THE PROGRAM of the health department seems more complex today than ever before, though a study of history might reveal that this is not a phenomenon of our age alone but a normal attribute of a changing, growing service, a situation to be welcomed rather than deplored. Indeed we would welcome new demands for services, new heights to conquer, if we only had enough staff to send up to each new mountain top. Shortage of people in the "service" occupations exists, however, and there is every prospect that it will continue to exist in the foreseeable future. We must therefore plan to use the available staffs wisely, wisely both in terms of the community's needs and

The paper is based on a talk given by Miss Arnstein at the June 1957 meeting of the New York State Public Health Conference, while she was chief of the Division of Nursing Resources, Public Health Service. Miss Arnstein is now the Service's chief of Public Health Nursing Services.

the staff's ability to meet those needs. Health workers, like all other people, need a feeling of satisfaction in a job well done; they should not perpetually feel frustrated by their inability to do all that they see needs to be done. This requires building priorities into our program plans.

The whole subject of deciding on priorities and acting on our decision has wide ramifications into all aspects of our lives. The differences in certain philosophies and religions is primarily a difference in what has priority. Psychiatry regards a person's inability to make a decision as a definite sign of mental illness. This indecisiveness is, in other words, the inability to give priority to one activity over another at any given instant. The person who suffers from this extreme of indecision often has to be hospitalized. But I wonder whether there are many of us at large who do not suffer from some degree of the same complaint. Be-

cause of it we say we are run ragged or exhausted by all the things we have been doing. How many of us have said at one time or another, "My workload is impossible!" "I can't do everything."

If I were a cartoonist I think I might draw the public health nurse as a beast of burden surrounded by people loading packages on her back, and more people in the distance coming with more packages. The labels on the packages are so familiar that I am not going to list all of them. We would see maternal and child health, tuberculosis, and school programs already securely tied in place, and heart, diabetes, and many others being added to the load. The caption on the cartoon would be "The public health nurse as she sees herself." In order to rescue this burdened, willing worker, we must decide what size load she can carry and then choose which bundles should go on her back on the first trip, and which on subsequent ones.

In this article, I would like to discuss the process of choosing which activities should have priority rather than discussing the activities themselves and trying to put them in rank order. Putting activities in order of rank carries the implication for me that there are times when some at the bottom of the list may not be reached.

The Selection Process

First we must consider what is involved in deciding which activity should have priority; then we must act on our decisions; and finally, we must feel satisfied with our actions—that is, we must not have guilty feelings that we have neglected something we should have done. Because each of these steps is progressively more difficult, most of us use escape hatches to save ourselves in the hope that somebody else will take the helm and spare us the trouble of plotting a course through the channel. One escape hatch is blaming someone else—the health officer, for instance, or the specialized consultant; in private life, our families or even our friends. Another is unwillingness to admit that there can be any priority: everything is of equal importance and must be done. The last method of dodging the priorities issue

often comes to the fore if one tries to help a friend or co-worker cut down on his workload.

Let us review the steps we go through sometimes unconsciously when we decide on priorities.

First, we must have knowledge: knowledge of the need for the activity; knowledge of what each action entails, why it is done, what the probable results will be if it is carried out, and what will happen if it is not; knowledge as to whether we are the only ones, or the proper ones to do it.

Second, we must have analysis: that is, seeing the separate facts we have gathered as a whole and in relationship to each other.

Third, we must have acceptance of the conclusions reached in the analysis. We have to believe emotionally as well as intellectually that the decisions are right. This is particularly difficult if someone else did the analysis, for example, if the health officer, or someone in the State health department passes on the results of his analyses to the local nurse who has to carry them out.

Fourth, we must feel as competent to carry out the programs given top priority as those given low priority. This is a crucial requirement when a major change in priorities occurs. If we don't feel equally competent in both areas we have to take steps to become so. If all these steps have been taken then the ultimate goal—action—will result.

Finally, we have to feel satisfied with the activities performed according to the priorities decided upon, and satisfied with those not performed because time did not allow us to get that far down the list. This feeling of satisfaction depends not only on our acceptance of the decisions we have made, but also on our own personalities.

Everyone has a need to be loved and some people need constant reaffirmation that they are loved. For many, this means that they are approved, that all their actions are approved by everyone, that they live up to the ideal they have set for themselves, and that they think others have set for them. We call these people perfectionists. Obviously when we use these terms to describe a perfectionist his goals become ridiculous. No one can please everyone all the time. In terms of the subject of this

article, no matter which actions we give priority to there will be some who think our analysis was wrong, or our judgment was poor, or if we had just applied ourselves more diligently we could have completed the whole list. As nurses we are particularly sensitive to this type of criticism. We—the majority of us—entered nursing to help people. All the studies to date have shown this to be the outstanding motivation. Society thinks of us as helping people and a helping person should help. She should not say “no” or suggest that someone else can do the service needed.

An example from our out-of-office lives illustrates these steps though we are not, as I said, usually conscious of going through them. The following activities have been proposed for a Saturday by someone, ourselves or others: (a) pay bills; (b) clean the house; (c) go swimming; (d) write a paper for *Nursing Outlook*. (There would be other activities on the normal Saturday list but this will do for purpose of illustration.)

What are the facts? That is, what is the need for the action, and what are the results if the activities are done or left undone?

pay bills?

Facts: There are 8 bills to be paid, received almost 1 month ago. Our credit rating is now A.

Results: If the bills are paid, credit rating stays high; if not paid, credit rating might drop but this is unlikely on the basis of 1 month's lapse.

clean the house?

Facts: It is dusty, the wastepaper baskets are half-full, it is in disorder. We have a rule that the house should be cleaned at least once a week.

Results: If the house is cleaned, dust and dirt will not be ground into fabrics and they will last longer; our aesthetic senses will be gratified. If the house is not cleaned, some day in the future we will have to replace the fabrics X number of years sooner; we will have less pleasure in looking at the house; the wastepaper may overflow, which is a nuisance.

go swimming?

Facts: This is a healthful exercise. The weather is hot. We have just read an article by Dr. Paul Dudley White—who is an authority—that exercise is important in maintaining health.

Results: If we swim we will feel fine, refreshed, and enjoy ourselves, but we may feel guilty or stay up half the night doing the other things on the list. If we don't swim, we will not get refreshed, may not do other things well, will resent our decision (or when younger, our mother's decision).

write the paper?

Facts: We promised the paper by July 1. Only 1 week is left; we have 1 free half day in the office next week.

Results: If the paper is completed, we will have great sense of accomplishment, appreciation from editors for promptness; when the paper is printed, our ideas will have an influence on others and also get recognition from co-workers. If we don't write the paper, we can do some of it in the office, can get it in late and be criticized by the editors, or can risk later publication.

Then comes the complicated analysis of the relationships of all of these facts to each other, and judgment enters in because there are no statistical measures. There is no one index marked “Satisfactory Saturday.”

This is the action which might be taken on the basis of the analysis of the facts. We decide to empty the wastepaper baskets but let the rest of the house cleaning go. The facts about the relationship of dirt to length of life of the material are not clearly proved; many other factors enter in. Aesthetics are not so important as we will either be swimming or writing the paper or paying bills. We decide we can pay some bills, then we will have time to pay the rest next week. We will swim, and start the paper in the office and finish it next weekend if necessary.

We can follow this same process in making a home visit. We are all familiar with the admonition to start our health supervision visits with the family's interest, meet their needs first. We have a harder time when it comes to teaching them the procedures we learned in our

schools of nursing. There are no priorities here; every step is equally important, or at least that is the way we often were taught.

It is not easy to decide which single thing one would teach a family if only one thing could be absorbed by them. It is a very good exercise to think about priorities in this way. After deciding what should come first, think what should be taught second if only two things can be taught, and so on.

For example, the public health nurse visits a household where she finds this situation: Mike, age 12, has a streptococcal sore throat. John, age 10, has previously had rheumatic fever. The boys sleep in the same room. In her background of knowledge, the nurse has specific facts about rheumatic fever and streptococcal infections. She analyzes these and forms a judgment. Priority 1 is to keep the boys apart. Priority 2 is to keep John taking prophylactic penicillin. By the time she has helped the family work out alternate sleeping arrangements for John, various ways of making sure he doesn't go into the room to play or to get something, the family's time and concentration powers have run out. So she does not teach anything further in this visit about the isolation technique, she says nothing about boiling dishes and burning paper handkerchiefs, for she has decided these have lower priority at this time. Nor does she mention anything regarding diet and care for Mike. Obviously we could go into much greater detail and discuss why she chose these priorities and whether or not we can agree with her. But stated in brief, this case is just one illustration of the omissions which must occur at times when one plays the priority game seriously.

This analysis of what is most essential in any given situation or procedure and why it is priority 1, 2, or 10 could be an important part of our teaching in the basic professional schools of nursing. It would help sharpen our thinking to consider why we do the things we do and their relative importance under varying conditions.

The Community Program

When we apply these steps in planning a public health program for the community, we

again get the facts first. We are on familiar ground in this first step. We know we must find out what the most important health problems of a community are before we develop a specific plan of action. We are accustomed to looking at mortality data and morbidity data when the latter is available. Today in most communities in this country we would find diseases of the cardiovascular system at the top of the list, with cancer and accidental deaths among the top five. Maternal and infant mortality would be at the bottom along with deaths from the acute communicable diseases. This is one set of facts about needs of the community, but there are others which may be in conflict just as there were in the activities for a Saturday in summer which I mentioned earlier.

There are facts about the interests and demands of various groups in the community. The school principals want a health program for the school children. The physicians want nurses to give injections in the homes—to their patients with anemia, allergies, or infections. The parents want poliomyelitis "shots" for their children and perhaps themselves.

The special consultants from the State health department are each pressing us to put our efforts into such different programs as positive health guidance for mothers and children, care of the posthospitalized tuberculosis patient, care of the posthospitalized mental patient, heart disease and cancer control programs, supervision of the health of the aged, especially in nursing homes, reemphasis on immunization against diphtheria and smallpox.

There is another set of facts we gather, and that is information about the community resources available to meet some of the needs revealed by the facts already listed. We are not alone; we need not try to do the whole job ourselves.

We find the Junior Chamber of Commerce has started a hospital program of recreation for older citizens; the tuberculosis and public health association used to be very active but has not done much recently; the local heart association has just been organized; the Junior League is working in the hospital outpatient department; there are a number of inactive nurses living in the community.

Although the above listing presents a com-

plicated picture, it is not nearly as complex as a real community would be. Obviously the analysis of these facts and their relationship to each other in order to arrive at priorities in our program will require time, thought, and judgment. When all factors had been taken into consideration we would probably find that no program activity would be completely ruled out. We would do part of each, giving more time—more priority—to some than to others just as we did when planning our Saturday's activities.

Our priority plan would help us in meeting pressures for more of any given service. If it had a low priority, the group exerting the pressure would have to show why this service should be moved higher in the list, thus automatically depressing other services.

This does not mean that the plan made at the beginning of the year, the beginning of the week, or even the day's plans can always be followed. In health work there are always emergencies; there are always unexpected demands. It may be poliomyelitis vaccination

clinics, or an influenza epidemic, or a special study of new drugs for home treatment of some disease which claims our attention. These may have to take priority for short periods over all other activities in our program plan. When this happens the decision has often been made by someone else, but if we understand the reason for the decision we can accept it and give it first consideration in our own minds.

In summary, in order to establish priorities we first must have knowledge based on facts and experience; we must make an analysis of the relationships of the various facts; then, because there are no mathematical formulas to show us which activity should have priority, we must use judgment in the interpretation of our analysis. The action we take, the program we carry out, is the result of the above procedures. We can then go home—if we have dealt with our personal need to please everyone—at the end of each day, at the end of each year, satisfied that, according to our best knowledge and judgment, what has been left undone was less important than what has been done.

U. S. Injury Estimates, July–December 1957

During the last half of 1957 about 25 million Americans were injured seriously enough to require medical attention or to limit their activities for at least a day, according to a preliminary report by the Public Health Service's U. S. National Health Survey.

Injuries during this period resulted in almost 214 million days of restricted activity, including 55.5 million days spent in bed at home or in a hospital. The report also shows:

- Home accidents injured 10,065,000 people, or 40.3 percent of all injured.
- Work accidents injured 4,173,000, or 16.7 percent.
- Motor vehicle accidents injured 2,444,000, or 9.8 percent.
- Other kinds of accidents and injuries resulting from violence involved 8,267,000, or 33.1 percent.
- Of the total injured, 14.1 million were males and 10.8 million, females; 14.9 million were urban residents; 7.1 million lived in rural nonfarm areas; and 3 million lived on farms.

The Preliminary Report on Number of Persons Injured, United States, July–December 1957 is the third in a series based on continuing nationwide household interviews, conducted for the Public Health Service by the U. S. Bureau of the Census.

Budgeting a Combined Health Department

A. D. SIDIO, M.S., and JOHN S. ANDERSON, M.D.

MERGING separate city and county health departments into one organization results in certain advantages, but specific obstacles must be overcome before the combined unit can be considered successful.

The foremost problem confronting any such combined department is that of obtaining an adequate budget. This is sometimes complicated by the city and county governments' differing on the amount each should contribute to the health department budget. Theoretically, the amount should be worked out between the two governments without any help or hindrance from the health department. When agreement is lacking, however, the department may find itself in the unwanted but necessary position of arbitrator, especially if lack of agreement threatens dissolution of a combined unit before there has been sufficient opportunity to demonstrate the advantages of combination.

The Pueblo City-County Health Department in Colorado was organized in July 1952. By written agreement, the city and county of Pueblo gave the new department the balance of the funds unexpended from the budgets of the former health departments, with which the new department was to operate until January 1953. Unfortunately, the written agreement between the city and county of Pueblo, permitting the formation of the department, contained nothing concerning the future financing of the de-

partment. This was a serious oversight, for the city and county governments had diametrically opposite viewpoints on the matter.

Pueblo County has a population of about 120,000. Approximately 80 percent of the population is in the city of Pueblo. There are only two, very small, incorporated communities in the county besides Pueblo. Most of the remaining population is in the fringe around the city of Pueblo.

City and County Debates

Before 1952, the county health department consisted of two nurses, a sanitarian, and a part-time health officer. Compared with the city health department, the operation was small. After the merger, the county government reasoned that its share would be proportionate to the population of the county excluding the city of Pueblo.

The city government postulated that since the residents of the city paid county taxes, they should expect to get health services from the county. In the city's opinion, it would be logical for the city to withdraw all its contributions and let the county assume the entire operation of the health department. The county countered by explaining that since the people of the city lived in a congested area, they had more public health problems, would need more health department services, and should expect to contribute more to the budget.

This debate continued each time the health department budget was presented from 1952 to 1956. Much time was wasted by all concerned. In 1955, the health officer went to 10 meetings in which the proportionate share of the budget was the only item discussed. Each year, some

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kind of compromise was reached; yet neither government felt that the arrangement was equitable.

In 1956, a complete impasse was reached in what had now become the routine annual health department budget conferences. Everyone had grown weary of hearing the same arguments over and over again without resolution. The inability of the two governments to reach agreement had nullified the otherwise increased efficiency of the health department. The dissolution of the combined department was imminent.

Devising a Formula

At this crucial moment, the department found it necessary either to assume the undesirable position of arbitrator or to see several years of hard work and progress go for naught. An attempt was made to express in mathematical terms population, taxes, and services within the city and county area outside the city. Population was eliminated as a necessary ingredient in the formula since for several reasons the services were not given on a proportionate basis. For example, the department provided the school nursing program in the county area, while the city schools had continued their own nursing program at the time. The idea was that, if the formula could correlate the extent that the city population was taxed with the amount of health services they received, the city's share of the budget could be determined equitably.

The formula, as originally presented to simplify explanations, was as follows:

$$C + E_c (B - C) = S_c B$$

where

C = The city's share of the health department's budget.

E_c = The assessed valuation of the city, expressed as a percentage of the total county valuation.

B = The net budget to be divided between the city and the county. (State contributions, income on vital statistics, and other funds would be subtracted from the gross budget to obtain the net budget.)

$(B - C)$ = That part of the budget paid by the county.

S_c = The percentage of the health department services provided inside the city.

The left side of the formula is the entire amount paid by the city, the funds coming

from the city's separate contribution and from the county for the county taxpayers living in the city. The contribution by the city subtracted from the total net budget represents the amount paid by the county. When the amount paid by the county is multiplied by the percentage of the county valuation inside the city, the portion of county taxes collected from the city residents is accounted for.

The right side of the formula represents what the city receives for the moneys paid. If the city receives a certain percentage of the services of the health department, then it is obligated to pay that percentage of the budget. This also holds true for the county. The formula is based upon each paying for the services received.

A similar formula could be worked out to determine the county's share, but this would be unnecessary. The formula is set up to determine the city's share of the budget, and the county's share can be determined by computing $(B - C)$.

Calculating the City's Share

Except for S_c all factors in the formula were known. The percentages of services provided in the city (S_c) could be determined from the daily activity reports in the Pueblo City-County Health Department. Statistically, this figure can be determined within reasonable accuracy without adding appreciably to the time required to prepare daily activity reports. The department personnel had been preparing activity reports for several years, although no differentiation between city and county work was made prior to January 1, 1956.

The manner in which the services given to the city is calculated seems complicated, but actually it is very simple administratively. Each person in the field codes the number of hours spent for the city and county. Office time and time spent on activities that cannot be conveniently broken down into city and county components are ignored, since they should be proportionate to the time spent on the various activities in the field.

General expenses, such as the health officer's salary and commodities used by the entire department are assumed to be proportionate to the division of the field services. Since field services were coded in the past, it did not add to the

department's administrative effort to code for the city and county breakdown.

For example, during the month of June, sanitarian "A" spent 87 hours for the city and 30 hours for the county in the field, thus 74 percent of his services were allotted to the city and 26 percent to the county. The entire division of sanitation field services were coded and tabulated in a similar manner. For the month of June, the department spent \$1,599.81 for salaries and retirement for the sanitarians doing work in the city. This was 69 percent of the total. In addition to the sanitarians, the sanitation section has other expenses such as the supervisor's salary, the secretary's salary, automobile expenses, vacation and sick leave, and laboratory expenses. All the above expenses are prorated by 69 percent and charged to the city. The sanitation section expended \$2,402.26 (69 percent) for the city and \$1,079.28 (31 percent) for the county during the month of June 1956.

The same procedure is used for the nursing, meat inspection, and vital statistics sections. These are the services that can be accurately divided into city and county components. The expenditures of each of these sections, according to the city and county divisions, are then totaled. In June, this amounted to \$6,505.11 (66 percent) for the city and \$3,327.20 (34 percent) for the county.

With the calculations for S_c completed, all factors in the formula were known.

Explaining the Formula

Our first problem, after we had established the validity of the formula through several critical reviews, including a legal review, was to explain the formula to officials unaccustomed to thinking in algebraic terms. The first step was to transpose the formula in order to show the city's share of the health department's budget. Thus:

$$C = \frac{B(S_c - E_c)}{1 - E_c}$$

Hypothetical values were then substituted for

the symbols in our explanation. For example, if the city had 50 percent of the assessed valuation and the health department was giving the city 50 percent of its services, then the city government should not be required to supply additional money to the department. Assuming that the budget is \$100,000, then

$$C = \frac{\$100,000 (0.5 - 0.5)}{1 - 0.5} = \frac{\$100,000 \times (0)}{0.5} = 0$$

If, however, the assessed valuation remains at 50 percent, but the city receives more services, then the city would be required to provide additional funds. Assuming that the net budget remained at \$100,000 and the city received 75 percent of the health department's services, then the city's additional obligation can be determined:

$$C = \frac{\$100,000 (0.75 - 0.5)}{1 - 0.5} = \frac{\$100,000 (0.25)}{0.5} = \$50,000$$

As the result of our efforts to devise a formula and our success in explaining it, both city and county governments agreed that the formula provided a fair and equitable means of determining their share of the budget. A new contract incorporating the formula was prepared and signed by both parties.

Conclusion

It is felt that this formula can be used successfully by other departments. The type of service will vary with each department, but the coding procedure can be adapted to meet the individual situations with ease.

The formula would be particularly applicable to combined departments where more than one governmental unit contributes to the budget. This would be true where several counties were combined into a district health department or where several cities within the jurisdiction of a county health department are expected to contribute to the department budget. The use of the formula should tend to eliminate much unnecessary work for those seeking approval for combined health department budgets.

Hospital records show that accidental injury is the chief cause of hospitalization, followed by hernia, heart disease, and tuberculosis. Leading causes of deaths are malignant neoplasms and heart disease.

Health Problems of American Seamen as Measured by Hospital Statistics

ROBERT W. BARCLAY, A.B., and EDYTHE A. GRAY, A.B.

THE HEALTH of seamen has long been a matter of concern to major maritime powers. In the United States, Congress authorized the President "to provide for the temporary relief and maintenance of sick or disabled seamen" in 1798, making merchant seamen the first group in this country eligible for medical care through Federal legislation. This action by Congress gave support to an industry that was an integral part of our national defense forces and vital to our foreign trade. At the same time, it provided the means for coping with a public health problem.

To a considerable degree, the public health problem of itinerant seamen without community ties has diminished. Living conditions on ships at sea and in boarding houses ashore have improved dramatically over those chronicled at the turn of the century. But seamen today continue to constitute a unique group whose occupation warrants special consideration of their health problems.

The merchant marine, long recognized as the "fourth arm of defense" and essential to foreign trade, is also an industry that requires a

high degree of risk to the health and physical well-being of its labor force. Seamen must undergo exposure to diseases through foreign travel as well as the health hazards of ship-board life. Close confinement and lack of professional medical attention for long periods when vessels are at sea are factors which can have far-reaching influence on health. In port, the seaman is frequently in need of medical care in a location many hundreds of miles from his home. For these reasons the United States and other maritime nations have seen fit to make special provision for the health needs of seamen.

Since seamen crews of merchant vessels are world travelers, national interest in the health of seamen has led to international recognition of the problem. In the early 1800's the United States Congress authorized the care of seamen from foreign-flag vessels in our marine hospitals, as they were then known, at the expense of the shipping operator. With the development of wireless communication, a program of medical advice to ships at sea was adopted that is today virtually worldwide. Lists of international venereal disease treatment facilities have been published for many years. More recently, a Joint International Labor Organization-World Health Organization Committee on the Hygiene of Seafarers has been formed.

In the United States, medical care is pro-

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vided for all seamen actively engaged in their occupation on American-flag vessels. Seamen with 60 days of continuous sea service are eligible for medical care while actively engaged in this work and for a 90-day period following their last sea service. We estimate that the number eligible for health services who were employed on vessels navigating the deep seas, the Great Lakes, and coastal and inland waterways averaged 162,500 in 1956 and 166,000 in 1957. (The year here and elsewhere in this paper refers to the Federal fiscal year, July 1-June 30. The estimate of employees is based on data in the Maritime Manpower Report and other information from the Maritime Administration in the Department of Commerce, the Fish and Wildlife Service in the Department of the Interior, and the American Waterways Operators, Inc.)

Seamen on American-flag vessels receive inpatient and outpatient medical and dental care through a network of Public Health Service facilities that also minister to the health needs of Coast Guard personnel, Federal employees with a job-related, compensable injury or illness, and several other categories of beneficiaries. The facilities used by seamen include 12 general medical and surgical hospitals, a tuberculosis hospital, and 2 neuropsychiatric hospitals. In addition, 26 outpatient clinics staffed with full-time personnel are operated in ports along the seacoasts and waterways in this country and its possessions. In another 98 locations, where the caseload does not warrant a full-time activity, care is supplied through contracts with private physicians for part-time service. Outpatient facilities are authorized to use local hospitals in emergency situations until patients can be transferred to the nearest Public Health Service hospital. Seamen receive about 40 percent of the total volume of care provided by these facilities. The following data indicate the level of utilization for seamen:

	1956	1957
Inpatient admissions.....	24, 184	25, 104
Average daily census.....	2, 359	2, 369
Inpatient discharges.....	23, 967	24, 658
Outpatient visits.....	438, 000	454, 973

It would be difficult to compare these gross measures of health services with standard or

average hospital utilization rates for the general population. The precise age-sex composition of the seaman labor force cannot be ascertained, and little is known about the extent to which seamen use health services outside Public Health Service auspices. These factors, however, do not preclude the development of a considerable quantity of informative material through analysis of hospital morbidity and mortality statistics. The causes of hospital admission and of hospital deaths are valid indicators of the major health problems of seamen. These data are reported to Washington for each patient discharged by Public Health Service hospitals and contract facilities. Information for seamen discharged in 1956 and 1957 forms the primary source of the data which follow. Ninety-nine percent of the patients were men. More than four-fifths were white; Negroes accounted for 10 percent, and another 3 percent were of other ethnic groups.

Causes of Hospitalization

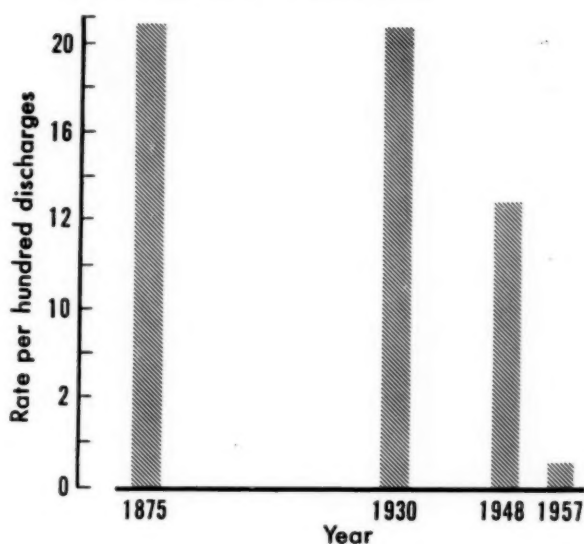
Injuries due to accidents head the list of causes for admission of seamen to hospitals. Other most frequently named causes are hernia, heart disease, tuberculosis, ulcers, and malignant neoplasms (table 1). These conditions

Table 1. Leading causes for hospital admission among seamen discharged from Public Health Service and contract hospitals, 1956 and 1957

Cause for hospitalization	1956		1957	
	Number	Rate per 100 discharges	Number	Rate per 100 discharges
All causes.....	23, 967	100. 0	24, 658	100. 0
Accidents (800-999)---	3, 173	13. 2	3, 385	13. 7
Hernia (560-561)-----	1, 465	6. 1	1, 614	6. 5
Heart disease (410-443)-----	1, 424	5. 9	1, 376	5. 6
Tuberculosis (001-019)-----	1, 173	4. 9	1, 204	4. 9
Ulcers of stomach (540-542)-----	768	3. 2	752	3. 0
Malignant neoplasms (140-205)-----	756	3. 2	739	3. 0

NOTE: Figures in parentheses are category numbers of the International Statistical Classification, 1948.

Figure 1. Hospitalization of seamen for venereal disease, Public Health Service and contract hospitals, selected years.



represent the cause for about one-third of the hospitalizations of seamen, and they account for slightly less than one-half of their total days of hospitalization each year.

Injuries due to accidents were the cause of hospitalization for more than 13 percent of the discharged patients in 1956 and 1957. The high standing of this category among the conditions leading to hospital admission is a reflection of the hazardous nature of the seaman occupation. In its Accident Facts for 1957 the National Safety Council reports that the marine transportation industry had the highest rate of disabling injuries (number of injuries per million man-hours) among 40 major industry groups. The 3,173 seamen discharged in 1956 following hospitalization for treatment of injuries included 989 patients with fractures (excluding those of skull and face bones and fracture residuals); 812 with open wounds, contusions, and the like; 614 with dislocations, sprains, and strains; 371 with intracranial injuries; and 387 with other injuries.

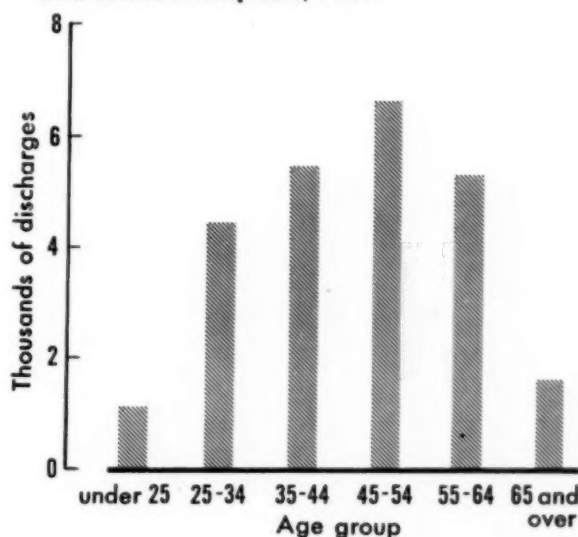
There has been little change in the relative frequency of injuries due to accidents as a cause of hospital admission among seamen during the past 10 years. This condition has ranked first since the late 1940's. Before then, however, venereal disease was the most frequently named cause of hospital admission. There were entire

wards set aside in Public Health Service hospitals for long-term treatment of syphilis. With the introduction of penicillin, hospitalization of seamen with venereal diseases was sharply curtailed. Although approximately the same number of seamen were discharged from hospitals in 1930 and in 1957, admissions for venereal disease amounted to more than 5,000 in 1930 as compared with 265 in 1957. As recently as 1948, venereal diseases have accounted for a substantial share of the hospitalizations of seamen (fig. 1).

The list of leading causes for hospitalization of seamen reflects some conditions traditionally associated with the maritime industry, such as accidents and tuberculosis. It also includes two relative newcomers, heart disease and malignant neoplasms. The number of seamen with these latter conditions indicates that the average age of the seamen labor force is increasing. This indication is borne out by analysis of the age distribution of the seaman discharged from hospitals. Between 1948 and 1957 the median age increased from 37.9 to 47.0 years; in 1957, seamen 65 years of age and older outnumbered those under 25 years of age (fig. 2).

The frequency rates for the leading causes of hospital admission vary considerably according to the age of the patients. Accidents represent a relatively small share of the conditions treated among older patients, who tend to have

Figure 2. Age at time of hospital admission of seamen discharged from Public Health Service and contract hospitals, 1957.



substantially more heart disease and malignant neoplasms (table 2).

Seamen treated only for accidental injuries during a period of hospitalization had an average length of stay of 17 days in 1956. This compares with 15 days for seamen with a diagnosis of hernia, 23 days for those with heart disease, 111 days for those with tuberculosis, 20 days for those with ulcers, and 35 days for those with malignant neoplasms. These figures are based on single-diagnosis cases not requiring further immediate hospitalization. Transfer cases are excluded.

These differences in length of stay for the leading causes of hospital admission and the variation with age in types of conditions treated help to explain why older seamen tend to be hospitalized for longer periods than younger ones. Other factors are contributory, however. Older patients tend to be treated for more conditions per hospital admission than younger seamen and to remain hospitalized longer even for the same conditions. The variation in length of stay by age group is shown below:

Age (years)	Median stay (days)
All ages.....	17
Under 25.....	10
25-34.....	13
35-44.....	15
45-54.....	18
55-64.....	22
65 and older.....	23

Causes of Hospital Deaths

A total of 518 hospital deaths were reported for seamen in 1956 by Public Health Service hospitals and contract facilities. Of this number, 208, or 40 percent, were attributed to malignant neoplasms. The next most frequently named cause was heart disease, which accounted for 109, or 21 percent, of the hospital deaths (table 3).

For all males in the general population, heart disease is the leading cause of death, both in and out of hospitals. Heart disease deaths far outnumber the deaths attributed to malignant neoplasms. This same relationship is observed among male patients dying while hospitalized under the Saskatchewan Hospital Service Plan.

Table 2. Leading causes of hospitalization for seamen, by age: rate per 100 discharged patients, Public Health Service and contract hospitals, 1956

Cause for hospitalization	Age at time of admission (years)		
	Under 45	45-64	65 and older
Accidents.....	17.6	10.1	5.8
Hernia.....	4.6	7.7	5.2
Heart disease.....	1.6	8.5	17.6
Tuberculosis.....	4.2	5.5	4.0
Ulcers of stomach.....	3.2	3.5	1.3
Malignant neoplasms.....	1.0	4.3	10.0

NOTE: For International Statistical Classification numbers for cause categories, see table 1.

Of 1,853 male deaths reported by general hospitals of Saskatchewan in 1951, 447 were the result of malignant neoplasms as compared with 532 caused by heart disease. Among the seamen included in our study, however, the number of deaths from malignant neoplasms is almost twice the number of deaths attributed to heart disease. (The Saskatchewan data were supplied by the Division of Public Health Methods, Public Health Service, which obtained them from the Saskatchewan Hospital Service Plan.)

This difference is probably explained by the effects these diseases have on the employment pattern of seamen. Seamen with heart disease

Table 3. Hospital deaths among seamen, by age, Public Health Service and contract hospitals, 1956

Cause of death	Age at time of admission			
	All ages	Under 45	45-64	65 and older
All causes.....	518	73	332	113
Malignant neoplasms (140-205).....	208	23	139	46
Heart disease (410-443).....	109	7	72	30
General arteriosclerosis (450).....	27	0	15	12
Cirrhosis of liver (581).....	26	2	19	5
Tuberculosis (001-019).....	18	3	11	4
All other.....	130	38	76	16

NOTE: Figures in parentheses are category numbers of the International Statistical Classification, 1948.

which is not rapidly progressive to death become unfit for duty at sea and consequently lose their eligibility for medical care. The end result of the disease in these patients is not reflected in these figures. Malignant neoplasms, however, frequently cause relatively quick death. Hence, many more seamen with malignant neoplasms than with heart disease are likely to be eligible for care throughout the course of their disease.

That the older seamen tend to leave the labor force is indicated by a comparison of the ages of hospitalized seamen and of Saskatchewan males. In Saskatchewan in 1951, the proportion of discharged patients 65 years of age and older was 20 percent. The corresponding figure for the seamen in our study was less than 7 percent.

Adjusting for the difference in ages between the seamen and the Saskatchewan males would not change the picture substantially. Of the deaths of seamen aged 45-64 years, 139 were attributed to malignant neoplasms and 72 to heart disease, still a ratio of 2 to 1. The number of deaths due to malignant neoplasms among Saskatchewan males in this age group was 130 as compared with 139 for heart disease.

Another comparison for discharged patients aged 45-64 years, however, shows that the proportions of hospital admissions for malignant neoplasms were approximately the same among seamen and Saskatchewan males. Heart disease, on the other hand, was the cause of hospitalization for a greater proportion of the seamen (table 4).

These data support the hypothesis that seamen with heart disease leave the maritime labor force and thereby lose their eligibility for medical care. The fact that deaths due to malignant neoplasms far outnumber those caused by heart disease among seamen receiving medical care in Public Health Service and contract facilities cannot, therefore, be interpreted as evidence of an association between the seaman occupation and malignancies.

Tuberculosis, like malignant neoplasms and heart disease, ranks high as a cause of death

Table 4. Malignant neoplasms and heart disease among hospitalized seamen and Saskatchewan males aged 45-64 years

Cause for hospitalization	Seamen		Saskatchewan males	
	Number	Rate per 100 discharges ¹	Number	Rate per 100 discharges ²
Malignant neoplasms	491	4.5	561	4.4
Heart disease	973	9.0	1,029	8.1

¹ Based on total of 10,842 discharged patients, excluding tuberculosis patients.

² Based on total of 12,780 patients discharged from general hospitals.

as well as a cause of hospitalization. In 1956, 18 deaths among hospitalized seamen were attributed to tuberculosis, about 3.5 percent of the total hospital deaths. This figure is considerably smaller than the proportion in past years. Tuberculosis accounted for 15 percent of the hospital deaths among seamen in 1948 and 5 percent in 1954.

Summary

Examination of morbidity and mortality statistics from Public Health Service hospitals and contract facilities indicates that accidents, hernia, heart disease, tuberculosis, ulcers, and malignant neoplasms are today the major health problems of American seamen. These conditions represent the cause for about one-third of all hospitalizations of seamen and account for slightly less than one-half of the days of inpatient care they receive.

Venereal disease, once the leading cause of admission to hospitals among seamen, has virtually disappeared as an illness requiring inpatient care.

Malignant neoplasms and heart disease are named as the underlying cause for 60 percent of the hospital deaths. Deaths due to tuberculosis have decreased sharply from levels of a few years ago.

Association of Bats with Histoplasmosis

CHESTER W. EMMONS, Ph.D.

TWO YEARS ago, a family moved into an old frame dwelling in a rural neighborhood near Clarksburg, Md. Shortly thereafter several members of the family became ill with histoplasmosis. The number of bats living in the attic of the house, the quantity of bat guano in the attic and on the ground adjacent to the foundation walls, and the isolation of *Histoplasma* repeatedly from all four sides of the house out to a distance of 5 feet suggested the source from which one fatal and several clinical illnesses in the family were acquired. A clinical report of this outbreak will be made separately.

The environmental conditions associated with this family epidemic may be significant in explaining the epidemiology of certain cases of histoplasmosis occurring in rural families. They may be especially significant in explaining the puzzling distribution of histoplasmin sensitivity and cases of histoplasmosis in certain towns and cities where there is no known association with chickens and where saprophytic sources of *Histoplasma* have not yet been detected.

The saprophytic growth of *Histoplasma* in soil is so frequently associated with chicken excreta that it receives the immediate attention of the epidemiologist confronted by a case of histoplasmosis. The patient is questioned carefully concerning the presence of chickens in his environment and the extent of his exposure to them. Any episode involving removal of litter

and excreta from a chicken house, or its use as a fertilizer on garden or lawn, is at once assumed to have provided the effective exposure. Laboratory isolation of *Histoplasma* from the material under suspicion often strengthens this assumption. However, a preoccupation with the patient's exposure to chicken excreta may lead to oversight of other associations which can be equally important but which have not received general recognition.

Zeidberg and associates (1) first called attention to the association between chickens and the saprophytic growth of *Histoplasma* in soil fertilized by their excreta. The first isolation of *Histoplasma* from soil was from a specimen collected under a chickenhouse, although the building was not identified in the report (2). This association has been widely recognized and confirmed by many investigators. Many isolations of *Histoplasma* from sites not associated with chickens have been reported, however. These include the earthen floor of a meathouse, miscellaneous farm buildings and a dog pen (3, 4), an old unused silo (5, 6), river water (7), a storm cellar, an old water tower, an old chalk mine, soil under a residence, low moist woodland, an abandoned schoolhouse (8, 9), and a hollow tree trunk (8-10).

One recognized association has been with caves known to be sources of infection for speleologists, casual visitors, or persons working in caves in the mining of guano or collection of other materials. In 1948, Washburn, Tuohy, and Davis (11) reported pneumonitis occurring in persons entering a cave. It is not reported whether bats were present. They called this disease "cave sickness" and suggested that it was a new disease entity. The patients did not re-

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act to histoplasmin or coccidioidin down to dilutions of 1:100 and 1:10, and no complement-fixing antibodies to these antigens could be shown in any of the 21 persons who became ill. On the basis of X-ray appearance, symptomatology, and one isolation of *Histoplasma* from the mouth of the cave, Grayston and Furcolow accepted this epidemic as histoplasmosis (8, 9).

An epidemic of proved histoplasmosis occurred in persons entering a cave in Venezuela (12, 13). Conversion to histoplasmin sensitivity and significant complement fixation titers were demonstrated, and *Histoplasma* was isolated from 4 of 5 soil samples taken. The cave sheltered a large colony of bats.

Cases of histoplasmosis occurred in 46 persons entering caves sheltering bats in the Transvaal in South Africa (14). Animals placed in one cave were also infected, and *Histoplasma* was isolated from the tissues of these animals. Speleologists from the Cape of Good Hope who have not entered caves in the Transvaal have remained histoplasmin-negative.

A cave in Peru has been described as the source of histoplasmosis, formerly known locally as "fiebre de Tingo Maria" (15). This cave is inhabited by a nocturnal fruit-eating bird (*Steatornis caripensis*), sometimes called the "oil bird" because of the oil obtained from its fat, which is highly prized by residents of the area. Many susceptible persons entering the cave to collect these birds have developed a pneumonitis which is now recognized as histoplasmosis. *Histoplasma* was isolated from soil in the cave, and its presence there was attributed to enrichment of the soil by droppings of *S. caripensis*. However, it is known that bats also inhabit the cave. Grayston and Furcolow, in reviewing epidemics of histoplasmosis (8), mention a personal communication from Dr. E. Englert, Jr., who observed pneumonitis in persons who scraped quantities of bat dung from the timbers of a bridge in Maryland.

Methodology

The methods used in the present study for isolating *Histoplasma* from soil were those described in 1954 (3), and were only slight modifications of the methods used in the original isolation of *Histoplasma* from soil in 1949 (2).

Soil specimens were scooped up directly into sterile 25 by 50 mm. pyrex test tubes and the cotton stoppers were replaced to permit drying of the specimens. If the specimen is sealed, as by a screwcap top, the humidity of even a moderately dry soil encourages germination of fungus spores, germination of weed seeds, and activity of microfauna with a resultant rapid change in the microflora.

Immediately upon return to the laboratory, 10 to 15 ml. of the specimen was removed to another 25 by 150 mm. tube, 0.8 percent sodium chloride solution was added nearly filling the tube, a sterile rubber stopper was inserted, and the suspension was shaken vigorously for a half minute. The suspension was allowed to sediment for 10 to 15 minutes and 5 to 10 ml. of the supernatant was removed by pipette to a conical glass or small beaker. For each ml. of the supernatant, 0.25 ml. of an antibiotic solution (2 mg. streptomycin and 5 mg. penicillin per ml. water) was added and 1 ml. of this inoculum was injected intraperitoneally into each of 5 or 10 Swiss, white, general-purpose mice. The mice were killed after 4 weeks and cultures were made from liver and spleen. In the specimens with a high fecal content, it was sometimes necessary to increase the amount of antibiotic or to treat the inoculated mouse with antibiotics the next day. The remainder of the original soil suspension was held at room temperature for reexamination if necessary.

The House and Its Environs

The repeated isolation of *Histoplasma* from soil adjacent to the foundation of a bat-infested house near Clarksburg, Md., where several cases of histoplasmosis occurred, points to a relationship between this disease and the presence of the house bat.

My attention was brought to the Clarksburg episode when Dr. Donald Pohl, of the Children's Hospital in Washington, D. C., referred an infant with severe histoplasmosis to the Clinical Center of the National Institutes of Health in Bethesda, Md. The child had acquired a fatal infection shortly after its family had moved into the old house. Several of its siblings were also ill.

I first visited the premises with Dr. Pohl on

October 10, 1956. The only large building on the premises, where presumably the children were infected, was an old, 2-story frame residence (see illustration). The only other structures were a small shed 40 feet east of the house, which had been used many years before for chickens but was now a doghouse and storage shed, and a privy 150 feet southwest of the house.

The front dooryard consisted of bare, firm, clay soil, with a patchy lawn of bluegrass and other grass beginning about 15 feet from the house. The lawn east of the house sloped to the south and consisted of grass and weeds intersected by a bare soil pathway, deepened by erosion, extending nearly parallel to the east wall and 3-15 feet distant from it. The back dooryard to the south, except for small patches of grass and weeds, was bare for several feet adjacent to the house. Beyond an apple tree, which supported a child's swing, was a scattered accumulation of refuse where trash had been burned and ashes had been dumped. West of the house was a weedy grass lawn, sloping to the south.

The house was in poor repair, with loose siding and cornices containing apertures sufficiently large for the entrance of bats. One conspicuous irregular hole in the siding halfway up the east wall of the house was approximately 4 by 10 inches in size and showed evidence of frequent use. Bat dung was apparent on the ground adjacent to the solid stone and cement plastered foundation on all four sides of the house. It was especially abundant on the west side of the house where large quantities had fallen from the roosting sites of the bats in the attic and wall, and had accumulated between the exterior siding and the inner wall of the house. From this voluminous deposit, it had sifted out between the loose siding boards to the ground.

The family was aware that the house sheltered a colony of bats, and inspection of the attic revealed a large colony of the common brown bat or house bat, *Eptesicus fuscus*, and several bushels of bat guano. Sixteen bats were captured and brought to the laboratory where they were killed, measured, identified by the writer, and spleen, liver, and lung were cultured for fungi. In order to utilize more fully the



Histoplasma was isolated from soil adjacent to the stone and cement plastered basement wall on all four sides of this house. The hole in the east wall of the house and holes in the cornices were used by bats to gain entrance to the attic.

material, the brains were removed, pooled, and injected into mice in a test for rabies. No pathogenic fungus was isolated, and no Negri bodies were found by A. C. Faber who examined the mouse brains.

Isolations From Soil

When the premises were first visited in October, 28 soil samples were collected. Ten of these were adjacent to the doghouse and 18 were taken adjacent to the foundation of the house, the outside entrance to the basement, and inside the basement. As these latter samples were collected, we observed many bat droppings which had sifted out from accumulations under the loose siding or had fallen to the ground as bats entered the attic. Three of the ten samples taken adjacent to the doghouse were positive. *Histoplasma capsulatum* was isolated from 1 of 5 samples taken inside the cellar and from 11 of 13 samples taken adjacent to the foundation. It is noteworthy that positive samples were obtained from all four sides of the house.

On a second visit to the home on March 11, 1957, two samples were collected from soil adjacent to the foundation on the north side of the house. Both were positive.

On June 26, 1957, 24 hours after a 1-inch rain, 21 collections were made. The soil was

moist but well drained. Ten specimens were taken at approximately 1-foot intervals in a northerly direction from the north side of the house, across the front dooryard which was composed largely of bare, hard-packed earth, extending to the bluegrass sod lawn beneath an oak tree 25 feet from the house. *Histoplasma* was isolated from only one specimen collected adjacent to the foundation.

Cryptococcus neoformans was isolated adjacent to the foundation and from specimens taken 3 and 5 feet from the foundation. When this series of specimens was collected, expectorated sputum was observed on the moist soil at several points. The patches of sputum were avoided in collecting soil samples, but it was assumed that many other sputums, no longer visible, had been spit upon the yard adjacent to the front porch and elsewhere on this side of the house. The time interval since recovery from histoplasmosis of all surviving members of the household would preclude relating these sputums to pulmonary histoplasmosis, but they might relate to the isolation of *Cryptococcus* from these sites, where *Histoplasma* was not found.

Three specimens were taken adjacent to the foundation and at 1-foot intervals eastward from the northeast corner of the house; all were positive for *Histoplasma*. All five specimens taken at the foundation and at 1-foot intervals eastward from the southeast corner were positive. Of the three specimens taken near the foundation on the west side of the house *Histoplasma* was isolated from two, and all mice receiving the third specimen died within 24 hours.

Collections were made again on July 11, 1957, at a time when the soil was quite dry. Specimens were taken adjacent to the foundation and at approximately 1-foot intervals along three parallel lines running eastward. Among 10 specimens collected along the first line, only one adjacent to the foundation and one 1 foot from it were positive. Of 10 specimens along the second line, 4 from the sites marked at 0, 1, 2, and 3 feet and a fifth 6 feet from the foundation, were positive. Along the third line, 5 of 6 specimens taken adjacent to the foundation and out to a distance of 5 feet were positive.

Collections were made on August 22, 1957,

when the soil was dry, and specimens were taken adjacent to the foundation and at approximately 15-inch intervals running eastward from the house foundation, most of these specimens being from underneath bluegrass sod. Of 10 specimens, only the 4 adjacent to the foundation and extending out to 3½ feet were positive.

Eighteen soil samples were collected on September 30, 1957, again adjacent to the northeast corner of the house and running eastward at intervals of 1 to 3 feet. The first 5 specimens, extending to 3 feet from the foundation, were positive for *Histoplasma*. *C. neoformans* was isolated from the sixth specimen, which was in a footpath 5 feet from the house. *Histoplasma* was isolated from one specimen 9 feet from the house.

It seems apparent from the sampling already done that *Histoplasma* can be isolated consistently from soil adjacent to the foundation of this house and that its ability to grow here is related to the presence of bat droppings. It is further remarkable that there is no apparent association with chickens or other birds. The precise interval since chickens had been kept on the premises was not known by the residents except that it had been many years before. It is further remarkable that, although most of the studies of the spatial relationship were made on the north and east sides of the house, *Histoplasma* was isolated on all four sides, including the south side which was somewhat shaded by an elevated porch and a tree and the west side which had no protection from the sun.

Since the study was begun, we have been comparing selected soil samples taken near the foundation and positive for *Histoplasma* with samples taken at a distance of several feet and from which *Histoplasma* was not isolated. The soil is acid (pH 5.3-6.7) without consistent or significant differences in pH reactions between positive and negative soils. Unweathered bat dung has a pH reaction of 6.2 to 7.1. To date, although several hundred fungi have been isolated, we have not recognized significant differences in the microflora of positive and negative specimens. Sampling will be continued throughout 1958 in an investigation of the extent to which distribution of *Histoplasma* is limited on these premises and in a further search for seasonal differences, for histoplasmosis in

bats, and especially for micro-organisms which may either stimulate or inhibit *Histoplasma* in the highly competitive environment of soil.

Conclusion

The special significance of this study relates to a possible explanation of the prevalence of histoplasmin sensitivity and the occurrence of clinical cases of histoplasmosis in certain urban areas where the sources of infection are not yet recognized. It is a well-known habit of the brown bat (*E. fuscus*), sometimes called the "house bat," to live in crevices and attics of old houses, and "it is often seen about street lights in large cities where it finds congenial habitation in dark nooks in the roofs or in accessible crannies in the buildings" (16). Solitary individuals or pairs may roost throughout the active season behind the shutters of residences and seek shelter for hibernation in more protected spaces in the same or neighboring buildings or in caves in the winter. Fairly large colonies may inhabit the false fronts of shops or store buildings of an architectural style popular 50 years ago. The house bat is urban as well as rural in its choice of residence.

In view of the findings reported here, *Histoplasma* should be sought in soil samples adjacent to any buildings infested or colonized by bats in towns where histoplasmin sensitivity is observed under circumstances not readily explained by known exposures to the litter of chicken houses or other commonly recognized sources. It should be sought in towns where there is a differential histoplasmin-reactor rate, especially if the higher incidence of reactors is in an older part of town. Large old houses, even if in good repair, offer more crevices and shelters for bats than the small compact houses of new real estate developments.

This remarkable association of bats with a severe family epidemic of histoplasmosis and with the presence of *Histoplasma* adjacent to the foundation of the house may not be unique. Enrichment by bat feces of soil near a building infested by the house bat appears to be as effective in supporting the saprophytic growth of *Histoplasma* as bat guano is generally supposed to be in those caves associated with cases

of histoplasmosis. The wide distribution of the house bat and its intimate association with man and human dwellings may well support a widespread reservoir of *Histoplasma* in soil to which man is frequently exposed.

Summary

Histoplasma capsulatum was isolated from 50 of 105 soil samples from 6 collections made between October 1956 and September 1957 on the premises where a family epidemic of histoplasmosis had occurred. Chickens, often associated with the saprophytic growth of this fungus, had not been kept on the premises for many years.

Histoplasma was isolated from 45 of 66 soil specimens (68 percent) taken adjacent to or within 5 feet of the foundation wall of the house and from only 2 of 29 (6.8 percent) taken 6-18 feet from the house. Three of ten samples taken near a doghouse were also positive.

The house sheltered a colony of the brown, or house, bat (*Eptesicus fuscus*), and bat dung was found adjacent to the foundation. The presence of bats is the apparent factor responsible for the constant saprophytic infestation of soil on these premises with *H. capsulatum*.

The house bat inhabits suitable shelters in towns and cities, as well as rural areas, and may be the ecologic factor responsible for the presence of *Histoplasma*, prevalent histoplasmin sensitivity, and clinical histoplasmosis in observed instances of urban histoplasmosis in towns and cities where reasons for the occurrence of these phenomena have not yet been determined.

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Cerebrovascular Diseases Classified

All known types of brain "strokes" have been classified and defined for the first time in a 2-year study conducted by a committee appointed by the National Institute of Neurological Diseases and Blindness, Public Health Service. The committee, comprising eight of the Nation's leading physicians, was formed to explore ways of facilitating research in cerebrovascular diseases.

In addition to setting up a common language for the exchange of information of researchers, the classification serves as a useful tool in the treatment of "strokes." Precise diagnosis is imperative in new treatments for several types of brain blood vessel diseases, the study points out.

Nine major categories are set up in the classification, with changes in tissue the determining factor in the groupings. Two categories include the majority of cases: blocks in a blood vessel and rupture or hemorrhage of a blood vessel. Next important is temporary lack of blood without tissue death.

In emphasizing the pioneering character of the study, Dr. Clark H. Millikan, neurologist of the Mayo Clinic, Rochester, Minn., and committee chairman, said that many statements in the study may undergo modification as understanding of the diseases increases.

Copies of the study, A Classification and Outline of Cerebrovascular Diseases, which appeared in the May 1958 issue of *Neurology*, may be obtained from the National Institute of Neurological Diseases and Blindness, Public Health Service, Bethesda 14, Md.

Decreasing Radiation In Photofluorography

EDWARD L. ERNSBERGER

DURING the last several years, considerable attention has been given to reducing the amount of diagnostic X-radiation that medical and dental patients receive. With this objective, research has concentrated on the radiographic process, making improvements in intensifying screens and film emulsions, to reduce exposure of both film and patient without loss of detail of the diagnostic picture.

A major consideration is that up to 98 percent of the density of a radiograph, except for the nonscreen type of film, may result from the actinic rays given off a fluorescent screen under the influence of X-ray energy. The remaining density is a consequence of X-rays directly. In photofluorographic work, the radiograph is obtained by a purely photographic process. A camera records on photographic film the image appearing on a chemically treated surface that fluoresces under the influence of X-radiation.

The period of film exposure required to obtain an image by this photographic procedure determines the necessary period of X-ray production. Therefore, shortening the necessary photographic exposure time, by use of a "brighter" fluorescent screen or a more sensitive film emulsion to record the image, permits corresponding reductions in X-ray exposure time for the patient and in the amount of scattered radiation the technician and others in the vicinity of the X-ray machine will absorb.

Faster Film Emulsions

Within the last few months, a new green-sensitive photofluorographic film (A), type PFG-470, which has a faster emulsion than film produced previously (A), type PF-470,

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has been put on the market. This new film was tested in the Electronics and Technical Service Laboratory, Tuberculosis Program, Public Health Service, to compare its emulsion speed with that of the earlier type.

Both types of film were exposed on a 70-mm. photofluorographic X-ray machine, using a safety-timer instead of a phototimer. An impulse counter (one impulse being equal to $\frac{1}{120}$ second) was connected across the field coil of the main contactor to measure the time of each exposure. A Presdwood phantom, representing the patient, was used in front of the hood. The grid in front of the fluorescent screen was removed so that grid lines would not interfere in making density readings. The X-ray machine was operated at 100 kilovolts peak and 175 milliamperes. All factors, except time, were kept constant, and exposures were made on both types of film.

The two strips of film were processed simultaneously by the temperature-time technique in open tanks containing regular X-ray processing solutions. After the film was washed and dried, the density in the same area of each frame of film was measured by a densitometer. The base plus fog level density was measured in the clear area between each two frames and subtracted from the density reading in the frame to obtain the density of the emulsion. The emulsion density readings and the film density readings were then plotted against time periods in impulses, and smooth curves were drawn through the points for both types of film (fig. 1). By choosing a density reading and noting the corresponding exposure time on each curve, the comparative speeds of the two films were obtained.

It is noteworthy that the new film emulsion is twice as fast at the density of 1 as the older type. The older type has a colorless base in contrast to the light purple base of the new. This, of course, affects the overall apparent density and makes the new type of film 2.8 times faster than the old at the density of 1.

Less Radiation

Another study carried out in this laboratory determined the effect of added filtration on:

1. Skin dose received by a patient from a 70-mm. chest photofluorogram.
2. Exposure time.

The work was done in a bus unit containing a 70-mm. photofluorographic machine. All exposures were phototimed, and an impulse counter was connected across the field coil of the main contactor to measure the time in multiples of $\frac{1}{120}$ of a second. Again a Presdwood phantom was used. A condenser R meter with a 25-roentgen chamber was used to measure the radiation at the surface of the phantom, which represents the skin dose received by the patient. Pieces of half-hard-rolled aluminum sheet, 0.025 inches thick, were used for the added filtration.

X-rays were produced at 100 kilovolts peak and 175 milliamperes, first with no added filtration, then with added filtration, in steps of 0.025 inch. The observed data are graphed in figure 2. An increase in the period of exposure is required with increased filtration to obtain a given density; radiation experienced by the phantom in the direct beam decreases, neverthe-

Figure 1. Comparison of speed of two types of photofluorographic film (100 kilovolts peak, 175 milliamperes).

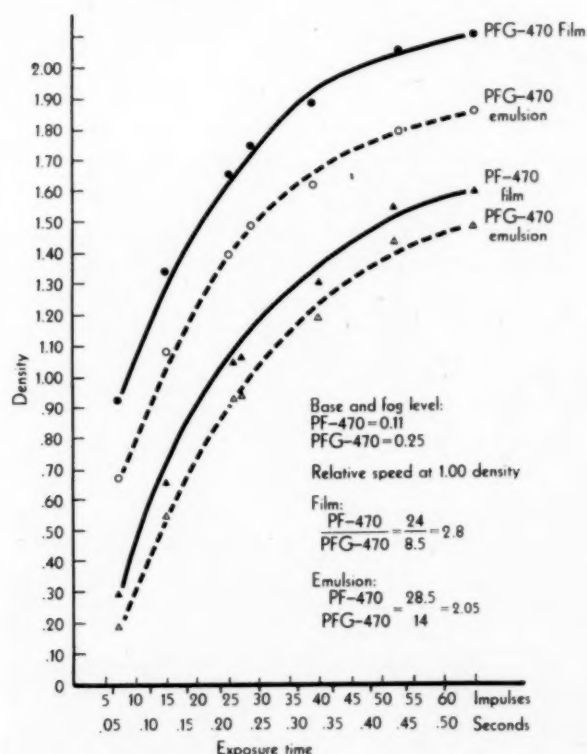
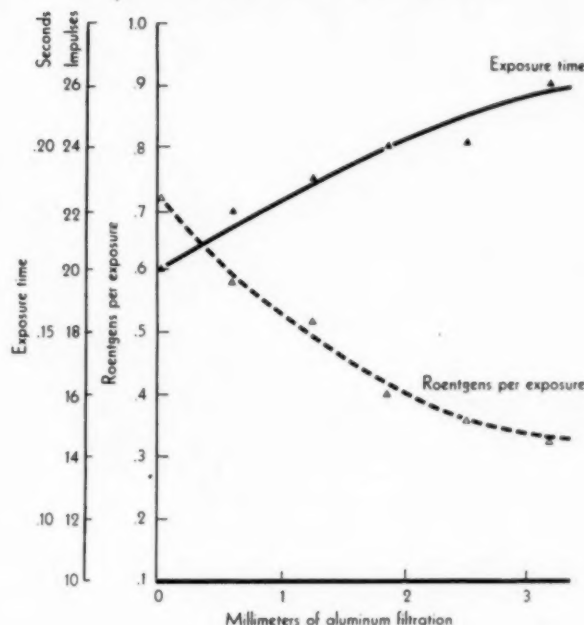


Figure 2. Effect of aluminum filtration on exposure time and radiation dose.



less. With 3 mm. of added aluminum filtration, the phantom received only 55 percent of the dose received without such filtration even though the length of exposure increased 30 percent. The aluminum filters out those X-rays of longer wave length which are absorbed by the patient and do not contribute to the brightness of the fluorescent screen.

Summary

A new type of photofluorographic film (PFG-470) requires an exposure period only half as long as the earlier type (PF-470) to obtain a radiograph of the same density. Thus, the patient receives only one-half the radiation. If 3 mm. of aluminum filtration is added, the patient will receive approximately half the radiation dose he would receive without it, with either type of film, even though the exposure time must be increased a third to obtain an image of a given density.

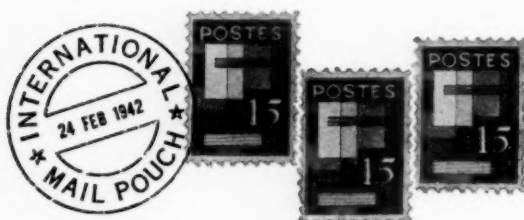
To illustrate these reductions, for a fluorogram of a patient of average size made with the earlier type of film and no added filtration (100 kilovolts peak and 175 milliamperes), the exposure time may be 18 impulses, or 0.15 seconds. If 3 mm. of aluminum filtration is added

with this type of film, the patient will receive only half as large a dose of radiation although the exposure time will be increased to 24 impulses, or 0.20 seconds. If the new film is used, which simultaneously halves both the exposure time and the dose, an exposure of 12 impulses, or 0.10 seconds, will suffice, and the

radiation dose will be only one-fourth of that received with the older type of film without the added filtration.

MATERIALS

(A) Type PFG-470 and type PF-470 film, Eastman Kodak Co., Rochester, N. Y.



Health Survey in Nepal

Our bureau of local health services has finished its first health survey, reporting on 157 persons in Hitaure, Nepal, in territory described as "Paradise" in a recent travel movie. In the last 5 years, deaths occurred in 20 of the 30 families surveyed; 7 of the deaths came before 1 year of age and 13 before the age of 20.

The 34 women questioned in the survey had had 9 abortions or stillbirths and 142 deliveries of live babies; but 18 of these infants died before the age of 1 year. These figures mean an annual mortality rate of more than 4,000 per 100,000 or 4 per 100 population. This rate cannot be projected because of the small sample, but Hitaure's mortality rate may possibly represent all of rural Nepal.

—RAYMOND E. STANNARD, M.D., *public health adviser, U. S. Operations Mission, Nepal.*

First Conference

Thailand's first national conference of public health workers was held at Chonburi in March 1957. From all parts of the country, 200 health officers, nurses, sanitary engineers, health educators, and other workers gathered to confer, review, and plan for the nationwide public health program.

—ANDREW P. HAYNAL, *deputy chief, public health adviser, U. S. Operations Mission, Thailand.*

Cochabamba's Boycott

The 100,000 people of Cochabamba were vaccinated in 7 days when smallpox broke out in this Bolivian city. Health service workers found 218 cases, but it is assumed that many others were hidden and that some infected persons left to escape isolation.

In a mass campaign 24 teams of medical students vaccinated house by house, 5 teams of nurses vaccinated at schools and factories, and 16 vaccination clinics were set up at government and private agencies and in industrial plants. Cochabamba's 29 pharmacies were given instructions and equipment for inoculations.

Local authorities and the public joined in a voluntary boycott which was decisive in the campaign's success. Banks, restaurants, buses, cinemas, and public offices refused to serve unvaccinated persons.

Glycerinated smallpox vaccine previously used in Bolivia proved to be of doubtful potency; several persons vaccinated a month before developed the disease during the outbreak. Lyophilized vaccine was imported from France and Peru for the mass vaccinations.

At the close of the campaign, 105,548 people—including both the resident and floating population—had been vaccinated. These were identified by indelible ink marks on the finger tip, which helped to establish the number inoculated.

As the campaign extends to rural areas of Cochabamba Department and later to the rest of the nation, it is expected that smallpox will be wiped out in Bolivia.

—HARALD S. FREDERIKSEN, M.D., *chief, health, housing, and welfare field party, U. S. Operations Mission, Bolivia.*

Serologic Studies of Staphylococcal Enterotoxin

E. P. CASMAN, Ph.D.

THE NEED for a simple and specific technique for demonstrating and assaying staphylococcal enterotoxin has been recognized for a long time. Research efforts ranging from biological tests with small and relatively cheap animals (1, 2) to extensive chemical and serologic studies of enterotoxin (3) have not attained this important objective.

The many contradictory reports found in the literature (4) on staphylococcal enterotoxin are evidence of the inadequacy of the crude, difficult, and impractical tests that are available for its detection. Evidence incriminating suspected foods in outbreaks of staphylococcal food poisoning is largely circumstantial and is limited to the use of epidemiological findings and the demonstration of the presence in the suspected food of appreciable numbers of enterotoxin-producing staphylococci. The very ubiquity of the staphylococcus and, conversely, the possibility of the presence of the heat-resistant enterotoxin in foods which no longer contain viable staphylococci, detract considerably from the value of such procedures.

Furthermore, the demonstration of enterotoxigenicity of the isolated staphylococcus involves considerable effort. The isolated organism must be cultured on special media in order to produce the enterotoxin, and the presence of the latter is determined by the feeding of monkeys or the parenteral introduction of the culture filtrates into monkeys or cats. When available, human volunteers may be fed

the suspected food or the culture filtrate. Monkeys, cats, and humans vary considerably in their susceptibility to the enterotoxin and may acquire an increased tolerance to it. Prior to parenteral administration of the culture filtrate it is necessary to remove or neutralize the alpha or beta hemolysins which may be present. These toxins are lethal and may in themselves elicit the emetic reaction characteristic of the enterotoxin. The monkey-feeding test, although specific, is impractical because of its low sensitivity, the marked variation in susceptibility of the animals, and obvious problems of their cost, availability, handling, and maintenance.

Parenteral administration of the enterotoxin to cats is complicated by the activity of the alpha and beta hemolysins, by rapid production of increased tolerance to the enterotoxin, and by a considerable variation in susceptibility of test animals. This method is, however, more sensitive, cheaper, and more convenient than the monkey-feeding test. In the studies presented here, 3 to 10 ml. of culture filtrate was injected intravenously into unanesthetized adult cats, as described by Hammon (5). Prior to injection, alpha and beta hemolysins were removed by boiling, neutralization with antiserum containing antibodies for alpha and beta hemolysins, or by digestion with pancreatin (unpublished data). The cats were used once only.

Key strains of staphylococci, selected for the production of enterotoxin for immunization purposes, were checked for enterotoxigenicity by feeding culture filtrates to monkeys.

The studies described here were designed to

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determine the possible value of serologic procedures for the development of a practical test for staphylococcal enterotoxin and were carried out in the following sequence: (a) production of enterotoxin in a simply prepared and dialyzable fluid medium; (b) separation and concentration of the enterotoxin for purposes of immunization and serologic testing; (c) demonstration of antigenicity by the passive transfer of immunity and by in vitro neutralization of enterotoxin, using serum from immunized rabbits; and (d) demonstration of an antigen common to enterotoxin-containing culture filtrates and absent in culture filtrates known not to contain enterotoxin.

Production of Enterotoxin

Since staphylococcal enterotoxin is produced in relatively small amounts, it was felt essential that a culture medium be used from which the products of bacterial growth could be easily separated. To this end, a medium was sought which was dialyzable, free from lipids, proteins, and carbohydrates, and capable of supporting good staphylococcal growth and toxin production.

Alpha hemolysin rather than enterotoxin productivity was studied in the early development of the medium, and later the adequacy of the medium for the production of enterotoxin was determined by comparison with preparations made in Dolman and Wilson's soft agar medium (6). Aeration by rocking (7) or rotation (8) of shallow fluid cultures in an atmosphere of 40 percent carbon dioxide and 60 percent oxygen was employed in this portion of the study.

Favorite and Hammon (8) suggested the use of a simple medium for the production of enterotoxin, consisting of a hydrolysate of casein enriched with glucose, nicotinic acid, and thiamine. To obtain good growth and toxin production, they found it necessary to inoculate the medium rather heavily with a culture prepared in a meat infusion peptone broth, thus supplying additional growth factors but at the same time introducing complex organic substances. In our hands this medium and procedure failed to give consistently good yields of either alpha hemolysin or enterotoxin.

When a commercially prepared acid hydrolysate of casein (Difco's Casamino acids) was employed, it was found that in order to obtain very good growth of staphylococci it was necessary to add calcium pantothenate, l-cystine, tryptophane, and magnesium sulfate in addition to glucose, nicotinic acid, and thiamine. To obtain good production of alpha hemolysin, it was found necessary to substitute sodium acetate for the glucose and to add an optimal amount of iron. The following formula, which was found to be best for growth and the production of alpha hemolysin, consistently supported the production of enterotoxin.

	Gram
Ferric citrate.....	0.025
K ₂ HPO ₄	1.0
KH ₂ PO ₄	1.0
MgSO ₄ · 7H ₂ O.....	0.2
l-cystine.....	0.025
Sodium acetate.....	7.0
l-tryptophane.....	0.075
Casamino acids (Difco).....	20.0
	Microgram
Calcium pantothenate.....	500
Thiamine hydrochloride.....	40
Nicotinic acid.....	1,200
	Liter
Distilled water.....	1

The pH was adjusted to 7.2-7.4 by the addition of approximately 1.0 ml. of 10 N sodium hydroxide, and the medium was sterilized by autoclaving at 121° C. for 15 minutes after distribution in the final container. Inoculums were small (0.1 ml. of an 18- to 24-hour broth culture) for 30- to 100-ml. quantities of medium and no special atmosphere was required. The method of aeration varied with the volume of toxin desired. The rotation at 20 rpm of 30-ml. quantities of the culture in 8-oz. nursing bottles (8), the rocking (7) of 100-ml. quantities in Roux bottles through an arc of 20° each 1½ seconds, and the sparging of air through larger volumes (9) all proved satisfactory. While enterotoxin was produced in all three procedures after 24 hours, rotated or rocked cultures were harvested after 30 to 48 hours of incubation at 35°-37° C. Larger volumes of culture were aerated by sparging with filtered air for 20 to 24 hours after inoculating with approximately one-tenth volume of a culture in

the same medium which had been incubated for 20 to 24 hours with rocking or rotation.

Separation and Concentration

It was necessary to concentrate and partially purify the crude toxin before use in attempts to immunize rabbits and in the serologic studies described below. This was accomplished briefly as follows: After removal of the organisms by centrifugation and filtration through a Selas candle, the filtrate was reduced in volume approximately 100 times by dialysis and concentration. Dialysis was carried out for 2 or 3 days at 5° C. against distilled water containing 1:1,000,000 merthiolate. Concentration was then accomplished by preevaporation in a current of air or by the use of a flash evaporator.

Some of the larger volumes of culture filtrate were partially purified and concentrated by first adjusting the pH to 3.2-3.3 at 0° C. with 1:5 HCl to precipitate a considerable amount of nonenterotoxic material and then precipitating most of the enterotoxin from the supernatant by slowly adding methanol to a final concentration of 25 percent while maintaining the temperature at -5° C. or lower.

In some of the immunization studies in which toxins prepared with enterotoxic staphylococcus strains No. 224 and No. 230 were used, digestion with crystalline trypsin was found to remove the hemolysins without appreciable destruction of the enterotoxin. After such treatment, however, it was necessary to increase the concentrations of methanol to 40 to 65 percent in order to precipitate the enterotoxin.

The crude concentrates obtained by these procedures varied considerably in potency, containing from 200 to 1,000 cat-vomiting doses per milliliter. A cat-vomiting dose is the minimal amount of enterotoxin which consistently produces emesis in cats. This is determined by injecting intravenously twofold serial dilutions into healthy cats.

The availability, later, of enterotoxins of higher potencies permitted a considerable acceleration in the progress of the present study. These were concentrates of toxins of strains 196E and S6 obtained through the courtesy of Dr. G. M. Dack. The toxins had been pro-

duced in a protolysate medium (10) and the dry S6 preparation had been considerably purified, using procedures described by Bergdoll (3). The crude 196E concentrates contained appreciable amounts of alpha and beta hemolysins and varied in potency, having a dry weight of from 10 to 90 μ g. per cat-vomiting dose. The partially purified S6 preparation contained a small amount of alpha hemolysin and no beta hemolysin and consistently produced emesis in cats with as little as 2 μ g. dry weight.

Demonstration of Antigenicity

In the exploratory stages of this phase of the study, immunization of rabbits was carried out over a long period of time, using as antigen trypsin-digested concentrates of No. 224 enterotoxin prepared in a variety of ways and injected at variable dosages both intravenously and subcutaneously. Rabbits were found to possess a marked though variable susceptibility to enterotoxin. When the intravenous route of injection was employed, some rabbits were killed in 12 to 24 hours by 1 or 2 cat-vomiting doses. It was necessary, therefore, to build up resistance to the enterotoxin gradually. One or two cat-vomiting doses in 1 or 2 percent alum were repeatedly injected intracutaneously or subcutaneously, or both, until a tolerance to the intravenous injection of approximately two vomiting doses of the enterotoxin was established. The amount of antigen was then increased and injected subcutaneously. The intervals between injections were adjusted according to the animal's maintenance of weight. In later stages of the immunization, in which larger amounts of antigen were used, the alum content was increased to 10 percent and the antigen was administered subcutaneously in divided doses. All alum-containing antigens were adjusted to a final pH of 6.0 and were preserved with 1:10,000 merthiolate.

Antigens prepared with 196E concentrates or with the partially purified S6 enterotoxin were not subjected to tryptic digestion. Both potassium alum and Freund's adjuvants (emulsion of 2 parts of antigen dissolved or suspended in saline, 1 part Falba, and 1 part paraffin oil, with 0.02 percent killed human

tubercle bacilli and preserved with 1:10,000 merthiolate) were used in the preparation of 196E antisera (11). For the preparation of anti-S6 sera, only Freund's adjuvants were employed.

Sera were obtained from the rabbits under immunization from time to time and tested for their antienterotoxin content either by preliminary mixture with approximately 2 vomiting doses of homologous enterotoxin (neutralization) 1 or 2 hours before injecting cats or by their ability to produce in cats a passive immunity (protection) to approximately 2 vomiting doses of enterotoxin. In the latter procedure the intravenous injection of the serum was followed within 3 to 5 minutes by injection of the challenging dose of enterotoxin. The amount of serum required to demonstrate neutralization or protection varied with the rabbit source, the duration of the immunization procedure, and the potency and adjuvant composition of the enterotoxin antigen.

With the more potent enterotoxins 196E and S6 it was possible to demonstrate the production of "protective" antienterotoxin in a relatively short period of time after tolerance to the enterotoxin had been produced by the repeated intracutaneous, subcutaneous, and intravenous injection of 1 or 2 vomiting doses. For example, a rabbit prepared in this fashion could be injected subcutaneously with 1,000, 2,000, and 3,000 vomiting doses of 196E in 10 percent alum at 14-day intervals. Protection against 2 vomiting doses of the homologous enterotoxin was demonstrated with 0.3 ml. of serum obtained 10 days after the final injection of the antigen. Another similarly prepared rabbit was immunized with 25, 125, 250, and 375 vomiting doses of S6 antigen containing Freund's adjuvants. Protection against two vomiting doses of the homologous enterotoxin required the use of 0.8 ml. of serum obtained 30 days after the final injection of antigen. As little as 0.08 ml. of an anti-196E serum was found to confer a passive immunity against its homologous enterotoxin. In most instances, however, 0.3 to 0.5 ml. of serum was required to produce this effect.

The results of more than 65 tests, representing repeatedly confirmed observations, are summarized in the table. Results obtained with

serum fractions prepared according to the procedures of Nichol and Deutsch (12) and Aladjem and Lieberman (13) are included. Quantitative determinations of the antienterotoxin content of the antisera were not made. In no instance, however, was more than 0.5 ml. of the serum fraction, or its equivalent of whole serum, used. The antigenicity of the enterotoxins from the three staphylococcus strains, Nos. 224, 196E, and S6, is clearly demonstrated. All react with their homologous enterotoxins, and 196E antiserum protects against heterologous S6 and 230 enterotoxins. Pseudoglobulin as well as the globulin fractions of Nichol and Deutsch prepared from 196E antisera neutralized 196E enterotoxin and protected cats challenged with 196E and 230 enterotoxins.

Demonstration of a Common Antigen

With the production of sera containing antibodies for homologous and for heterologous enterotoxins, an attempt was made to reveal a serologic relationship between enterotoxin from different strains of staphylococcus. It was felt that the establishment of the serologic identity of staphylococcal enterotoxin or the pres-

Neutralization of enterotoxins by rabbit antisera and passive transfer of immunity as determined by the intravenous test on cats

Antiserum		Challenging enterotoxin	Results	
Immunizing antigen	Modification of serum		Neutralization	Protection
224	None	224	+	-----
224	do	230	-----	-----
196E	do	196E	+	+
196E	Pseudoglobulin ¹	196E	+	+
196E	None	230	-----	+
196E	B, C-1, C-2 fractions ²	230	-----	+
196E	Pseudoglobulin ¹	230	-----	+
196E	None	S6	-----	+
S6	do	S6	-----	+

¹ Pseudoglobulin prepared according to procedure of Aladjem and Lieberman (13).

² Fractions prepared according to procedure of Nichol and Deutsch (12).

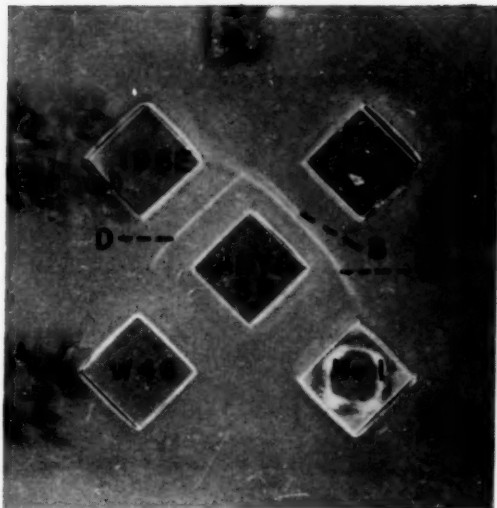


Figure 1. Zones of precipitation after absorption of anti-S6 serum with Wood 46 and No. 1 concentrates and an extract of No. 243 organisms. Illustrating the formation of a "line of identity" (the coalescence of lines D and B) and a "line of nonidentity" (the intersection of lines D and C). Evident also is the antigen excess effect obtained with the concentrated culture filtrate of strain No. 1 which, in addition to failing to produce a zone of precipitation, prevents the complete development of line B.

ence of a distinguishing antigen common to enterotoxigenic strains might permit the development of a test for the detection and assay of this toxin. A slight modification of the Petri-dish agar diffusion method of Ouchterlony (14, 15) for the qualitative analysis of soluble antigens and antibodies was used for this purpose.

In Ouchterlony's method, antiserum is added to a centrally located well in the agar and antigens are added to peripheral wells. Antigens and antibodies diffuse toward each other through the agar to form zones or lines of precipitation where the two combine in optimal proportions. The method permits separation of multiple precipitation systems into their individual components and, in addition, permits the comparison of two antigens or antibodies with each other in order to establish their identity, partial identity, or nonidentity (fig. 1).

In our study, plates were prepared with a base containing 1.6 percent Noble Special Agar (Difco), 0.8 percent NaCl, 0.01 percent merthi-

olate, 0.003 percent methyl orange, and M/25 veronal. The mixture was melted, adjusted to pH 7.4 and filtered through paper until clear. A central well and four peripheral wells were prepared using rectangular aluminum blocks, measuring 8 mm. square in cross section. A central hole, measuring 2 mm. in diameter was bored through the length of each block to facilitate its removal from the solidified agar. The wells were prepared by covering the bottom of a standard Petri dish with 10 ml. of the agar. After solidification, the blocks were placed in position and an additional 20 ml. of the agar was added and allowed to solidify. The blocks were carefully removed from the agar and arranged as recommended by Wilson and Pringle (16), with a distance of 7 mm. between the central serum-containing well and the peripheral antigen-containing wells. The plates were allowed to remain uncovered for 30 to 60 minutes at 35° C. prior to use. The wells were charged with 0.2 ml. quantities of the reagents and were not refilled. Results were recorded after 5 to 8 days at room temperature.

The S6 antiserum was found to contain antibodies for antigens possessed by both enterotoxigenic strains and nonenterotoxigenic strains of staphylococcus. It appeared necessary, therefore, to remove most of the antibodies for these common antigens before attempting to demonstrate the presence of an antigen peculiar to enterotoxigenic preparations and absent from those that were enterotoxin free.

To attain this goal, anti-S6 serum was first absorbed with concentrated filtrates of enterotoxin-negative strains Wood 46 and No. 1. Both strains gave negative tests for enterotoxin when injected into cats in amounts equivalent to 50–60 ml. of crude culture filtrate. The Wood 46 strain was obtained from the Connaught Laboratories, Toronto, Canada, in 1938. It is coagulase-positive, produces an appreciable amount of alpha hemolysin, and has also been found to be nonenterotoxigenic by other investigators. Strain No. 1 was isolated in 1949 from the stomach contents of an infant who succumbed to what appeared to be staphylococcal food poisoning. This strain differed from nonenterotoxigenic strains and resembled enterotoxin-producing strains in that it contained heat-stable antigen which was precipitated by anti-

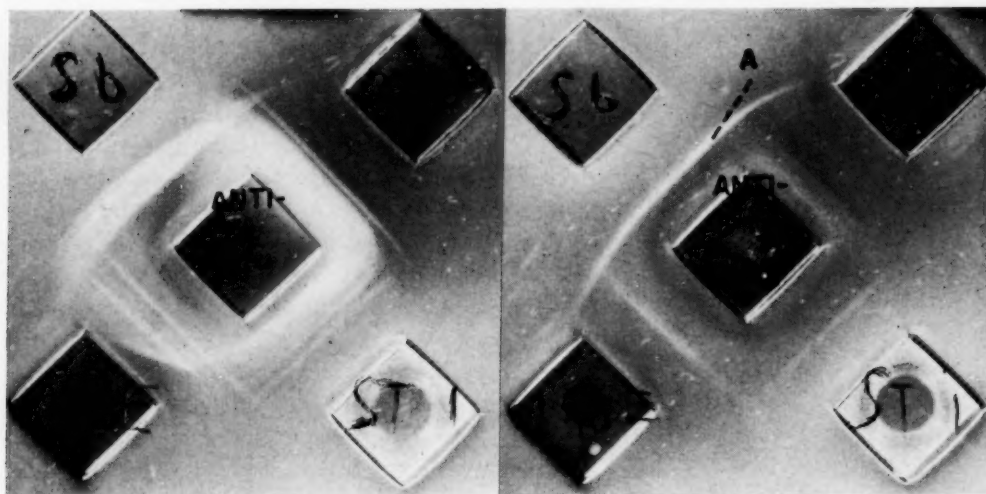


Figure 2. Effect of absorption of anti-S6 serum with concentrates of culture filtrates of strains Wood 46 and No. 1. Many of the precipitation systems produced with unabsorbed serum (left) are not obtained with the absorbed serum (right). Detection of coalescence of lines produced by heterologous 196E and No. 230 enterotoxins with one produced by the S6 antigen-antibody system is interfered with by heavy line A.

enterotoxigenic serum absorbed with a concentrated culture filtrate of the Wood 46 strain.

The effectiveness of the absorption procedures was determined by preparing Ouchterlony plates to demonstrate coalescing lines of precipitation (lines of identity) between S6 and 196E (see fig. 1) enterotoxins and the absence of such lines in the antigens used for absorption. For this purpose, the peripheral wells were charged with 100-fold concentrates of culture filtrates of the Wood 46 and No. 1 staphylococcus strains and with 2 to 4 cat-vomiting doses of S6 and 196E enterotoxins. Undiluted absorbed serum was placed in the central well.

Although absorption with the Wood 46 and No. 1 antigens removed much of the antibody in the serum (fig. 2), demonstration of a "line of identity" belonging only to the S6 and 196E toxins was not possible. This was due (a) to the possession by the No. 1 strain of staphylococcus of an antigen which was common to the enterotoxigenic strains although not found in the other nonenterotoxigenic strains under study, and (b) to the presence in the anti-S6 serum of an antibody which was not sufficiently absorbed by the Wood 46 and No. 1 concentrates so that a heavy masking zone of precipitation was produced in the Ouchterlony plate with S6 enterotoxin (fig. 2, right).

Culture filtrates of enterotoxigenic strain No. 243 differed from others under study in that, like the S6 enterotoxin, they produced a heavy masking zone of precipitation with the absorbed anti-S6 serum. Further absorption of the serum with a glass bead extract (17) of the cells of strain No. 243 removed the masking antibody. The cell extract rather than a concentrated culture filtrate was employed because of the presence of a smaller amount of enterotoxin in the cell extract. Assay for enterotoxin by injecting cats and for "interfering antigen" by titration with the Wood 46 strain No. 1-absorbed anti-S6 serum showed that the concentrated culture filtrate contained 7 times more interfering antigen but 30 times more enterotoxin than did the cell extract. Absorption of the absorbed serum with the extract of the No. 243 cells resulted in the production of a good, well-defined line of identity between the undiluted absorbed serum and S6 and 196E enterotoxins. Use of the more toxic concentrate of the culture filtrate of strain 243 instead of the cell extract for this purpose resulted in the production of a markedly less well-developed line of identity (fig. 3).

The effects of absorption with the enterotoxin-negative Wood 46 and No. 1 strains and with the No. 243 preparations are presented in

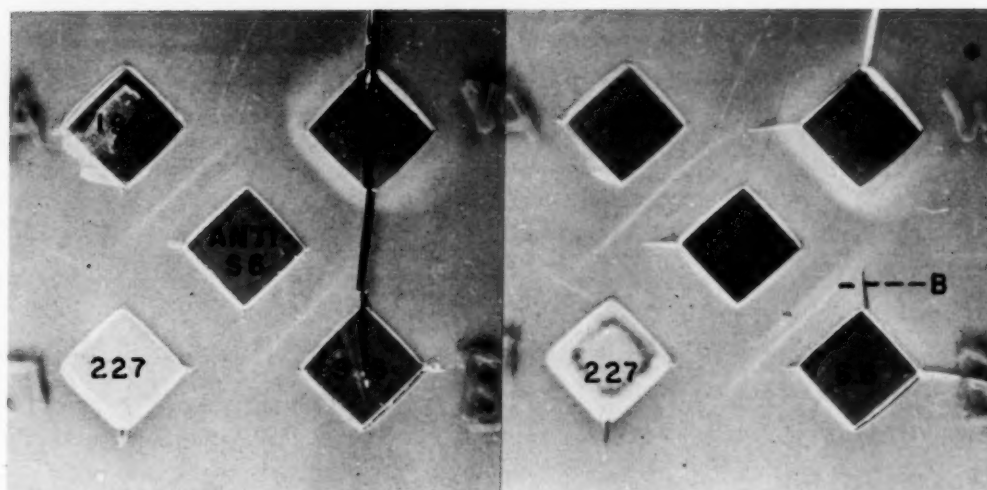


Figure 3. Effect of further absorption with either a concentrated culture filtrate of strain No. 243 (left) or an extract of No. 243 cells (right). Both absorbing antigens remove the heavy line of interference seen in figure 2. Absorption with the cell extract, however, removes less of the antibody which produces the single line with 196E and the more peripheral (line B, right) of the two lines produced with S6 antigen. The nonenterotoxic Wood 46 and No. 227 antigens produce no lines.

figures 2 and 3. The interference line of S6 was removed and only one good line of precipitation was formed with the heterologous 196E toxin. The outer of the two remaining lines formed with the homologous S6 toxin (line B, figs. 1 and 3) could be identified with the single sharply defined line formed with 196E toxin by placing these antigens in adjacent wells to produce clear-cut lines of precipitation which coalesced at the junction of the respective precipitation lines (fig. 1).

The absorbed S6 serum was used finally, to test 100-fold concentrations of culture filtrates of 21 strains of staphylococcus which had been found to be enterotoxigenic by the cat test and 6 enterotoxin-negative strains for their ability to produce "lines of identity" with 196E and S6 toxins. Of the 21 enterotoxigenic strains, 16 were isolated from foods epidemiologically incriminated in food poisoning incidents. Two were isolated during routine examination of foods not involved in food poisonings. Two were isolated from feces from patients with enteritis following intensive antibiotic therapy, and one (No. 244) from the nose of a child.

Typical results obtained with some of the culture filtrates are shown in figure 4. All but one of the enterotoxigenic strains gave lines of

identity with both toxins. The one exception, No. 244, was not a food poisoning strain but was isolated from the nose of a child. This strain gave a positive cat test for enterotoxin shortly after isolation, but, when retested, was found to have lost this ability. Of the 6 enterotoxin-negative strains, 5 produced no lines of any kind. The sixth, however, produced a well-defined line of identity with the two positive controls. This strain, No. 260, had been isolated during routine bacteriological examination at the New York City Department of Health Laboratories from crab meat which was not involved in a food poisoning incident.

The antigenic component common to the 21 enterotoxigenic strains is shared by strains No. 260 and No. 1, both of which are apparently nonenterotoxigenic. Strain No. 1 produces this antigen in relatively large amounts. This was shown by an antigen-excess effect when its concentrated culture filtrate was used in the Ouchterlony plate test. It failed to form its portion of the line of identity and also inhibited the development of the portion produced by the enterotoxigenic control (line B in fig. 1). Furthermore, the antibody in the absorbed serum responsible for the production of the lines of identity was present in small amount and could

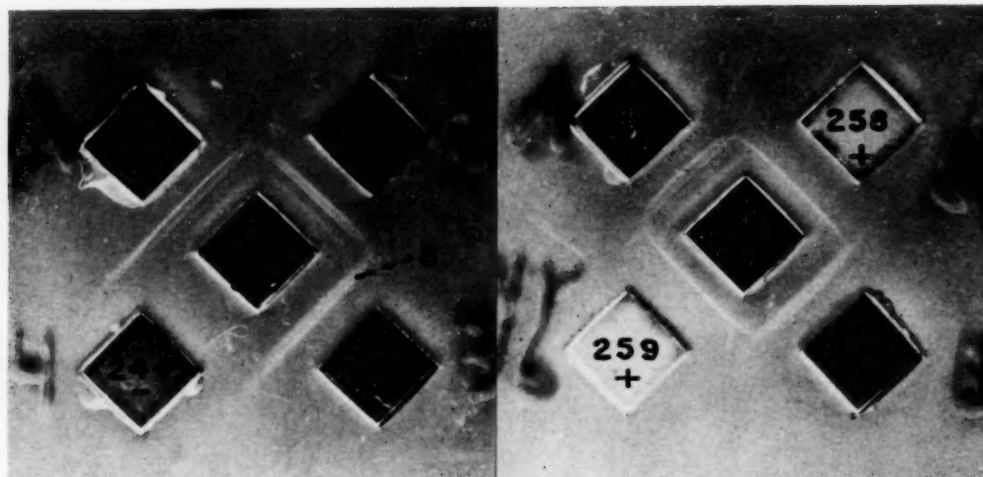


Figure 4. Examples of coalescing zones of precipitation ("lines of identity") formed between enterotoxigenic (designated with a plus sign) culture filtrates and the two control enterotoxins (S6 and 196E). Left: The line of precipitation produced with enterotoxigenic culture filtrate of strain No. 236 coalesces with the single 196E line and with the outer (line B) of the two lines produced by the S6 enterotoxin. The nonenterotoxigenic No. 244 produces no lines.

be removed completely by further absorption with the strain No. 1 concentrate. It was apparent, therefore, that it would be desirable to eliminate the use of this antigen for absorption of the anti-S6 serum.

Use of diluted anti-S6 serum after absorption with Wood 46 cells alone was subsequently found to be a better procedure for the procurement of an absorbed serum with which to demonstrate the antigenic component common to the 21 enterotoxigenic and 2 nonenterotoxigenic preparations. Wood 46 organisms removed from air-sparged culture by filtering and centrifuging were suspended in saline to give a heavy suspension, cooled to 4° C., and poured into 15 volumes of acetone at about -20° C. After standing overnight at -15° to -20° C., the acetone was removed and the cells were washed three times by suspending in acetone at -15° C. and centrifuging at -10° C. The organisms were then dried under vacuum and over CaCl₂ and stored at 5° C. Absorption of anti-S6 serum with acetone-dried Wood 46 cells was carried out by adding 10 percent (W/V) of the dried organisms to the serum, shaking until a uniform suspension was obtained, incubating at 37° C. with occasional shaking during a period of 2 to 3 hours, and placing at 5° C. overnight. The cells were removed by centrifuging

at 20-25° C. and washed with enough saline to adjust the absorbed serum to its original volume. The serum was absorbed a second time in the same manner and examined in order to determine the dilution giving a sharp

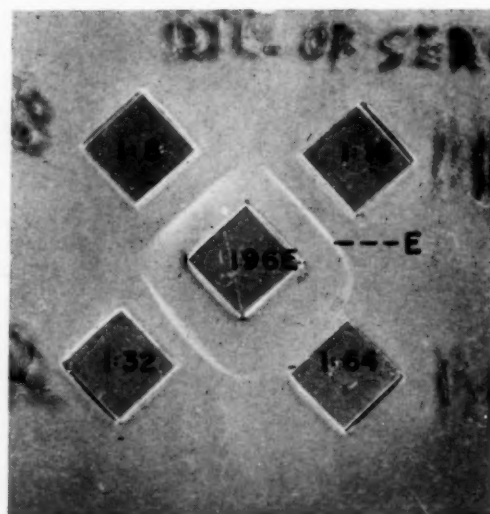


Figure 5. Effect of diluting anti-S6 serum (in peripheral wells) after absorption with Wood 46 cells, on the definition of the single line produced with the heterologous 196E enterotoxin (in central well). Use of a 16-fold dilution of the absorbed serum results in the production of the most sharply defined line (line E).

line with the heterologous 196E enterotoxin in the agar diffusion plate test (fig. 5).

The presence, in strains No. 1 and No. 260, of the antigen otherwise common only to enterotoxigenic strains, suggested the possibility that the use of other culture media and procedures might reveal their enterotoxigenicity. Cultivation of these strains in a mixture of 40 percent carbon dioxide and 60 percent oxygen instead of air and on Dolman's soft agar has yielded negative results. Attempts to demonstrate in the products of growth of these strains a protoxin similar to those described for some of the clostridial toxins (18-20) have yielded essentially negative results. In addition, attempts passively to protect cats against S6 enterotoxin with antiserum prepared against concentrated culture filtrates of strain No. 1 have also been unsuccessful, further indicating that the "common antigen" is neither toxin nor protoxin.

Discussion

The work of Dolman and Wilson (21) contributed substantially to the direction of the studies presented here. Using antiserum produced in a horse, they were able to demonstrate a specific flocculation reaction which appeared to involve the enterotoxin and its homologous antibody. They indicated the desirability of support of their findings with many flocculation tests performed "in conjunction with parallel kitten tests, and involving filtrates derived from a large number of strains."

The absence of such confirmative studies, in the light of present knowledge, would seem to be attributable to the difficulties involved in the production of a specific antiserum of sufficient potency and the necessary dependence on one or more of the inadequate tests for the enterotoxin. The presence of not more than 5 percent enterotoxin in the purest preparations so far prepared by Bergdoll (22) and the consistently positive emetic responses obtained in the present work with 2 μ g. of the partially purified S6 enterotoxin suggest a possible explanation for earlier failures to confer passive immunity (5, 23), since in these studies antisera were produced by immunization with relatively weak and crude preparations. In

addition, inability to obtain an active immunity to heterologous enterotoxins in monkeys (24) and in cats (25) may have discouraged such studies.

Conflicting reports as to the antigenicity of staphylococcal enterotoxin (5, 6, 23, 26, 27) indicated the need for studies designed to resolve this important phase of the problem. Although repeated demonstrations of the production of an acquired immunity or "increased tolerance" to enterotoxin had been made, the evidence for passive transfer of immunity was lacking.

Neutralization of enterotoxic preparations, however, had been reported. Dolman, Wilson, and Cockroft (28) found that the serum from a kitten made resistant to enterotoxin neutralized the enterotoxin when a mixture of the two was injected into a normal kitten. Davison, Dack, and Cary (29) confirmed this report when the mixtures were injected intraperitoneally. When the intracardial route of injection was used in kittens, or the intravenous route in monkeys, there was no neutralization by the serum, they reported. They also stated: "When normal kitten blood was added to a mixture of enterotoxic filtrate and antiserum and then injected intraperitoneally into normal kittens, protection was not assured." These investigators concluded that the presence of whole blood, extravascularly or intravascularly, prevented the neutralization of enterotoxin by its antiserum. Dolman (27), however, demonstrated neutralization of enterotoxin by serum from immunized human and animal sources by injecting enterotoxin-serum mixtures intravenously into cats. Hammon (5), working with crude toxins, failed to demonstrate *in vivo* neutralization through the use of "hyperimmune" sera from cats and rabbits. Surgalla, Bergdoll, and Dack (30) were able to demonstrate a neutralization of S6 enterotoxin after mixing the toxin with the homologous rabbit antiserum and feeding the mixture to monkeys. More recently, Burbianka (31), administering enterotoxin and antiserum to cats by the intravenous route, claimed to have neutralized a minimal enterotoxic dose of enterotoxin with as little as 0.005 ml. of an antiserum produced in rabbits. Antiserum, produced against enterotoxin derived from one strain of staphylococcus neu-

tralized the enterotoxin produced by other strains.

The evidence obtained with antigens prepared with S6, 196E, and 224 enterotoxins establishes conclusively the antigenicity of staphylococcal enterotoxin. The conferring of a passive immunity to cats injected successively with antiserum and challenging enterotoxin showed effective combination between the toxin and its antibody in the presence of whole blood.

The protection in cats obtained when 196E antiserum was challenged with heterologous 230 and S6 enterotoxins is of special interest in view of the conflicting report of Surgalla, Bergdoll, and Dack (24). These investigators, using the monkey-feeding test, found that monkeys possessing an active immunity to 196E enterotoxin were susceptible to S6 enterotoxin. The desirability of further work to demonstrate a passive immunity in the monkey when the challenging enterotoxin is given by mouth suggests itself. The possibility cannot be excluded, however, that differences in avidity or combining power of toxin and antitoxin or in the amounts of available antitoxin may be responsible for the conflicting observations. The short incubation period in staphylococcal food poisoning suggests the need for rapid neutralization of the enterotoxin.

The 21 "positive" culture filtrates appear to be serologically related and set apart from the 6 "negative" culture filtrates when examined by the agar-diffusion Petri dish method of Ouchterlony. The occurrence of the antigen common to the 21 enterotoxigenic strains in preparations obtained from 2 of 8 nonenterotoxigenic strains does not permit, at this time, the use of this antigen for the development of a reliable serologic procedure for the detection of enterotoxigenic strains. Should strains No. 1 and No. 260 eventually be found to be enterotoxigenic, more strains should be studied to establish the reliability of such a test. Furthermore, before the antigen can be identified with enterotoxin, a clear-cut demonstration of its enterotoxicity should be made.

Summary

A completely dialyzable fluid medium for the production of staphylococcal enterotoxin has been developed.

The antigenicity of staphylococcal enterotoxin and in vivo protection of cats against enterotoxin of heterologous and homologous strain origin has been demonstrated.

Of 29 strains of staphylococcus examined for enterotoxigenicity by the intravenous cat test 21 enterotoxigenic and 2 nonenterotoxigenic strains were found to be serologically related and set apart from the remaining 6 nonenterotoxigenic strains when examined by the agar diffusion test of Ouchterlony.

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John K. Hoskins, 1884-1958

John K. Hoskins, who entered the Public Health Service in 1913 and became the Service's first chief sanitary engineer in 1943, died on May 16, 1958, in Chevy Chase, Md.

Mr. Hoskins served as Assistant Surgeon General of the Public Health Service from 1944 to 1947, when he retired from the Service.

As chief of an outstanding group of engineer-scientists, Mr. Hoskins directed stream pollution studies on the Ohio River in the early decades of the century. The reports published by this group, classics in the field, include the original formulation of the basic law of the biochemical oxygen demand reaction and the "oxygen sag" curve, and procedures for ascertaining the bacterial quality of water.

In this 2-year followup of a survey performed in an epidemic area of North American blastomycosis it was found that blastomycin skin sensitivity may be retained for at least 2 years in the absence of histoplasmin sensitivity or evidence of clinical blastomycosis.

Followup of Blastomycin Sensitivity in an Epidemic Area

J. GRAHAM SMITH, JR., M.D., WALTER C. HUMBERT, M.D., and SIDNEY OLANSKY, M.D.

TO GAIN more information about sensitivity to the blastomycin skin test and its relation to reactivity to the complement fixation test, a second survey in the area of Grifton in Pitt County, N. C., was conducted on May 21, 1956. Covering a sample of the persons found positive to the blastomycin skin test or the blastomycosis complement fixation test in the first survey in April 1954, it provides data on conversions and reversions.

The survey in April 1954 was instituted because of an epidemic of North American blastomycosis affecting 11 patients during the winter of 1953-54 in Grifton (1). It included 70-mm. chest X-rays, tuberculin, histoplasmin, and blastomycin skin tests, and blastomycosis

complement fixation tests. No cases of blastomycosis or histoplasmosis were discovered, although one case of active pulmonary tuberculosis was found.

Of the 1,648 persons surveyed in 1954, 2.9 percent were blastomycin sensitive and 6.4 percent were histoplasmin sensitive. There was no correlation of the blastomycosis complement fixation test with blastomycin skin sensitivity. Of the patients with positive blastomycin skin reactions, 4.7 percent had positive blastomycosis complement fixation tests, as opposed to 2.8 percent positive reactors in the total population tested, but 30.2 percent of the individuals with positive histoplasmin skin tests also had positive blastomycosis complement fixation tests, as opposed to only 6.4 percent in the total population.

These findings strongly suggested cross-reactions between the histoplasmin skin test and the blastomycosis complement fixation test. Unfortunately, histoplasmosis complement fixation tests were not done; it was therefore not possible to test the hypothesis that the correlation between the two might be explained by cross-reactions between the histoplasmosis and the blastomycosis complement fixation tests. On the basis of evidence from the 1954 survey it was believed that the sensitivity to both histoplasmin and blastomycin antigens in some

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This paper was presented in part before the American Academy of Dermatology and Syphilology, Chicago, December 10, 1956. It is a follow-up of an earlier study, an account of which appeared in the February 1957 issue of Public Health Reports, pp. 95-100.

individuals might be explained partly by a common mode of infection rather than a cross-reaction (2).

Since the 1954 survey, 5 more cases of blastomycosis have been diagnosed in the same county, and 4 of these patients lived within a 4-mile radius of Grifton at the time of onset of disease. (None of the 5 patients, however, had been included in the 1954 survey.) Of the 4 cases occurring in the Grifton area, 3 had onset of pulmonary disease during the fall and winter of 1954-55, and the fourth patient noted a nodular lesion on the left leg in mid-January 1956. The diagnosis of blastomycosis was established by smear and culture in all of these patients, and all were treated satisfactorily with 2-hydroxystilbamidine.

The occurrence of these cases, as well as the desire to learn more about blastomycin and histoplasmin skin test sensitivity, prompted the second survey.

Method of Study

Because of limitations of time and personnel, as well as the subsidence of the community interest and hysteria engendered by the 1953-54 epidemic, it was decided that a maximum of information could be obtained by skin testing again all individuals who had had positive blastomycin skin tests or positive blastomycosis complement fixation tests in the 1954 survey. In the 1954 survey, 42 individuals given a blastomycin skin test had induration of 5 mm. or more at 48 hours, and 43 individuals, a complement fixation titer of 1:1 or more to *Blastomyces*. Since 2 individuals had both a positive skin test and complement fixation test, the total was 83. Letters were sent to this group requesting that they return for reexamination.

Of the 83 positive reactors in 1954, 43 reported for reexamination. These 43 constituted an excellent and presumably random sample of the 1954 group. Twenty-three of the 42 with positive blastomycin skin tests (54.7 percent) and 22 of the 43 with positive blastomycosis complement fixation tests, including the 2 individuals with both positive skin tests and positive complement fixation tests, composed the 1956 group. The 43 individuals

ranged in age from 3 to 65 years, and 23 of them were under age 20.

One-tenth milliliter of each of the two antigens was injected intradermally. Blastomycin antigen was placed in the right forearm, and histoplasmin in the left forearm, both injections at approximately the same level. New syringes and needles were used for each antigen. In no instance was a syringe or needle re-used during this survey.

The histoplasmin (lot H-42) was diluted 1:100. The blastomycin was a *Blastomyces* vaccine prepared from 6-day yeast phase cultures grown on brain-heart infusion blood agar slants at 37° C. The yeast cells were suspended in saline and heat-killed at 56° C. for 2 hours; the vaccine was diluted 1:1,000 by volume in a Hopkins tube before use. The vaccine dilution, although not strictly an extract, is referred to as blastomycin in this paper. Both of these antigens were supplied by Dr. Norman F. Conant, of Duke University.

At the time the skin tests were read, the individuals surveyed were interrogated about the state of their health. All skin tests were read 48 hours after injection of the antigens by measuring the diameter of areas of erythema and induration with a millimeter ruler. The tests were considered positive when induration was 5 mm. or more and doubtful when erythema was 10 mm. or more.

All 43 participants contributed blood for blastomycosis and histoplasmosis complement fixation tests. These tests were performed at the Communicable Disease Center of the Public Health Service in Chamblee, Ga., through the cooperation of Dr. Kenneth W. Walls.

The *Histoplasma* antigen used for the complement fixation tests was histoplasmin prepared from single strains of mycelial *Histoplasma capsulatum* grown on C. E. Smith's culture medium for the preparation of coccidioidin, incubated at 25° C. for 6 months (3). The cultures were killed with merthiolate, Seitz filtered, and then pooled.

The blastomycosis antigen used for the complement fixation test was prepared from one isolate of *Blastomyces dermatitidis* grown in brain-heart infusion agar at 37° C. for 5 days. The cells from this yeast-phase growth were washed from the agar, killed with merthiolate,

centrifuged and washed. A 20 percent suspension of cells was ground with sand (50 percent weight/volume) and centrifuged, to remove the particulate matter. The supernatant fluid was used for the antigen. This was the same type antigen used in the complement fixation tests performed in the earlier study (2). The complement fixations were titrated by the usual "box" titration.

Results

None of the 43 persons surveyed in 1956 gave a history of pulmonary disease, and none of the histoplasmosis complement fixation tests were reactive. The reactivity of the group to the blastomycin and histoplasmin skin tests and to the blastomycosis complement fixation test is shown in table 1. The changes in reaction

Table 1. Reactions to blastomycin and histoplasmin skin tests and to blastomycosis complement fixation test, Grifton, N. C., 1954 and 1956

Reaction	1954	1956
Blastomycin skin test:		
Positive.....	23	15
Negative.....	20	28
Histoplasmin skin test:		
Positive.....	9	15
Negative.....	29	28
Not done.....	5	0
Blastomycosis CF test:		
Positive.....	22	4
Negative.....	17	39
Not done.....	4	0

Table 2. Changes in blastomycin and histoplasmin skin tests and blastomycosis complement fixation test over 2-year period (1954-56), Grifton, N. C.

Items	Skin test		CF test
	Blastomycin	Histoplasmin	
Maintenance of reactivity.....	15	6	2
Conversion to positive test.....	0	7	2
Reversion to negative test.....	8	3	20
No reactivity.....	20	22	15
Total tested in both surveys.....	43	38	39

Table 3. Correlation of blastomycin and histoplasmin skin tests with each other and each with blastomycosis complement fixation test in the same individual, Grifton, N. C., 1954 and 1956

Test correlations	1954	1956
Blastomycin and histoplasmin:		
Both positive.....	6	4
Blastomycin only positive.....	14	11
Histoplasmin only positive.....	3	11
Both negative.....	15	17
Blastomycin with blastomycosis CF test:		
Both positive.....	2	1
Blastomycin only positive.....	17	14
Blastomycosis CF only positive.....	20	3
Both negative.....	¹ 0	25
Histoplasmin with blastomycosis CF test:		
Both positive.....	5	1
Histoplasmin only positive.....	3	14
Blastomycosis CF only positive.....	15	3
Both negative.....	11	25

¹ No individuals in this group because of selection of persons for 1956 survey.

NOTE: Only persons tested to both agents included.

from 1954 to 1956 are summarized in table 2.

Many of the persons with positive blastomycin (15 of 23, or 65.2 percent) and histoplasmin (6 of 10, or 60 percent) skin tests remained positive although reversions to negative occurred in both groups. Two of the three individuals whose histoplasmin skin tests reverted to negative had positive reactions to both histoplasmin and blastomycin in 1954. One of these two, a 3-year-old white girl, had an induration of 5 mm. to both antigens in 1954 and no induration to either in 1956. The other, a 9-year-old white boy, had 12-mm. induration with 40-mm. erythema to blastomycin and 15-mm. induration with 20-mm. erythema to histoplasmin in the first survey. Two years later the blastomycin reaction had 5-mm. induration with 11-mm. erythema, but the histoplasmin produced no erythema or induration. The third of the histoplasmin reverts was a 33-year-old woman. She had a negative blastomycin test in both surveys with 12-mm. induration to histoplasmin in 1954 and 4-mm. induration 2 years later.

Of the 8 persons whose blastomycin skin test reverted to negative, 2 maintained reactivity to histoplasmin, 3 showed no reactivity to histoplasmin, 1 was not tested with histoplasmin

at the time of the first survey and was non-reactive to both tests in the second survey, 1 developed histoplasmin reactivity, and 1 lost reactivity to both antigens as mentioned above. Of the 6 individuals with reactivity to both antigens, 2 were still reactive 2 years later.

Twenty of the 22 (91 percent) serums previously reactive to the blastomycosis complement fixation test were nonreactive in 1956. Seven conversions to a positive reaction to the histoplasmin skin test and two conversions to the blastomycosis complement fixation test were observed, but none to the blastomycin skin test. Three strengths of histoplasmin were used in 1954, and 5 of the 7 histoplasmin converters were in the group tested with the weakest histoplasmin (H-42, 1:1,000).

Table 3 shows the correlations of the two skin tests with each other and with the blastomycosis complement fixation test. All the possible combinations of positive and negative reactions to these three tests occurred.

Discussion

There were no cross reactions between the histoplasmosis and blastomycosis complement fixation tests; however, only 4 individuals had reactive blastomycosis complement fixation tests in the second survey. In the absence of clinical blastomycosis, a positive blastomycin skin test was maintained for as long as 2 years. Reversion to negative occurred in a considerable number of individuals, 8 of 23, or 34.8 percent. Reactivity to the blastomycosis complement fixation test was maintained 2 years in 2 individuals, and conversions of the blastomycosis complement fixation from nonreactive to reactive were observed.

The conversions of the histoplasmin skin test from negative to positive were not unexpected in this endemic area (4). The reversion from positive to negative in 1 individual may be explained by cross-reaction to the blastomycin skin test; in the other 2, by loss of sensitivity. These reversions are not unique, such a change having been reported in the past (5, 6). Reversion occurs also with the coccidioidin test in coccidioidomycosis (3) and the tuberculin test in tuberculosis (7).

A positive intradermal reaction to blastomy-

cin with a negative reaction to histoplasmin can occur, and although cross-reactions undoubtedly exist, the possibility that positive reactions to both antigens indicate dual infection, apparent or subclinical, must be considered. This is suggested because over a period of 2 years, of the 6 persons with dual reactivity, 1 lost histoplasmin reactivity retaining blastomycin sensitivity, 2 lost blastomycin reactivity retaining histoplasmin sensitivity, 2 maintained reactivity to both antigens, and 1 lost sensitivity to both. Individuals who have positive intradermal reactions to both antigens and maintain this reactivity over long periods of time may represent examples of subclinical dual infection, whereas those who lose reactivity to one antigen only may represent cross-reactions. Cross-reactivity could also be invoked to explain these changes in sensitivity; however, the occurrence of dual infections in man (8) and dogs (9) would suggest that this may not always be the case. Changes in the size of the reaction to the two antigens with time also may prove to be useful in differentiating the cross-reaction from inapparent or apparent infection.

Correlation of the results of all the tests in each individual shows that all the possible combinations of positive and negative blastomycin skin tests with reactive and nonreactive complement fixation tests may occur in persons who do not have clinical blastomycosis but who live in a blastomycosis epidemic area.

Summary

To examine further the reactivity of healthy individuals in a blastomycosis epidemic area to the blastomycin and histoplasmin skin tests, a second survey was conducted in the area of Grifton in Pitt County, N. C., in May 1956. It included 43 of the 83 persons who had had positive blastomycin skin tests or positive blastomycosis complement fixation tests in a survey in April 1954.

In the 2-year period, 34.8 percent of the previously positive blastomycin skin test reactors had reverted to negative, and 91 percent with previously positive complement fixation to blastomycosis were now negative. No conversions to positive blastomycin skin tests were found in the selected group included in this

survey, but two individuals previously negative to the blastomycosis complement fixation test were found to be positive.

Both skin sensitivity to blastomycin and blastomycosis complement-fixing antibodies tended to decrease in the 2-year period, but the complement-fixing antibodies disappeared in a higher percentage of the individuals tested.

Seven persons became reactive to the histoplasmin skin test and three lost their reactivity. The loss of reactivity in one instance might possibly represent cross-reactivity to the blastomycin skin test. None of the group surveyed had a positive histoplasmosis complement fixation test.

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Training in the Care of Prematures

The tenth year of the institutes for physicians and nurses in the care of premature infants will begin in the fall of 1958. The institutes are sponsored by the New York State Department of Health and the U. S. Children's Bureau.

The training is planned to meet the needs of physicians and nurses in charge of hospital premature nurseries and premature centers, and medical and nursing directors and consultants in State and local programs.

Attendance at each institute is limited to six physician-nurse terms. For physicians, the program lasts 2 weeks, and for nurses, 4 weeks. There is no tuition fee, and stipends are provided to help cover expenses during attendance. The institutes are scheduled to begin September 22, 1958; November 3, 1958; January 12, 1959; February 23, 1959; and April 20, 1959.

For additional information, write to Box 143, Institute in the Care of Premature Infants, New York Hospital, 525 East 68th Street, New York 21, N. Y.

The Institute of Agricultural Medicine of the State University of Iowa is unique in that it is devoted exclusively to the public health of rural areas. This interim report gives the first account of its research program.

Institute of Agricultural Medicine in Iowa

RICHARD A. TJALMA, D.V.M.

IN CONTRAST to urban dwellers, rural families have enjoyed relatively little of the protection afforded by public health agencies. For this reason, research at the Institute of Agricultural Medicine at the University of Iowa has undertaken exploratory studies of rural health, with identification of major needs as its first concern. With sympathetic collaboration by investigators in other centers, a general evaluation and demonstration of rural health programs will ensue.

Public health functions, historically, have been designed and organized to serve urban populations. Particularly is this true of the epidemiology of infectious disease, the foundation of public health work. The massing of large populations created an excellent breeding ground for epidemic and endemic infections. The wealth and governmental experience of the cities at the same time provided facilities for public health activity; otherwise, the cities would have perished.

Traditional public health methodology is not always applicable to rural conditions. Techniques of control and investigation, designed for urban settings, frequently are not well suited to the sparsely settled communities. The nature of local government structure in

some rural areas precludes the establishment of typical administrative public health programs. Disease and accident reporting, a prerequisite to efficient public health programming, is inadequate especially in areas that are not organized on a communitywide basis. Considerable study is needed to determine what the real health needs of rural populations are, how health services for rural segments of the population are being met, and wherein they can be improved.

Rural Health Hazards

The saying, "The farm is the safest and healthiest place in the world to live," is frequently heard in rural areas. Although it may be the "healthiest," available statistics show it to be something other than the "safest" place in which to live. The number of farmers killed on the job in 1955 exceeded that of any other single occupational group. Of a total of 14,200 occupational deaths, 3,700, or 26 percent, occurred among farmers, estimated at only 7 percent of the working population. On the basis of rates of fatal on-the-job accidents, farming is the third most dangerous occupation, only mining and construction outranking it (1a). The total number of farm injuries in 1956 was 1,050,000 (1b). Tractor accidents alone account for approximately 700 deaths among agricultural workers each year.

The variety and amount of chemicals in com-

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mon use on the farm suggest another health hazard. Expanding agricultural application of insecticides, fumigants, herbicides, rodenticides, fungicides, and even fertilizers has resulted in no less than one-quarter million brand-name chemical products now being used. An estimated national total of 3,300 accidental deaths are caused each year by the misuse of chemicals (2). Commercial label warnings, including instructions concerning precautionary measures, are often impractical under field conditions.

By virtue of their occupation, their environment, or both, farmers and other rural dwellers are frequently exposed to animal diseases. Iowa, with a total human population of approximately 2.5 million, has a domestic animal population which includes 6.5 million cattle, 1.3 million sheep, 12 million swine, and 30 million fowl (3). In addition, it is estimated there are more than 1 million dogs and cats.

Establishment of the Institute

Iowa, with a substantial rural population, has a vital interest in the health of agricultural workers. The opportunity to explore this area on an organized basis was made available by a 3-year grant from the W. K. Kellogg Foundation in September 1955. The Institute of Agricultural Medicine, the first in the United States, was established as a part of the department of hygiene and preventive medicine of the College of Medicine, State University of Iowa. After expiration of the original grant, the institute will continue to function as an integral part of the College of Medicine. Present personnel consist of a medical director, an industrial hygienist, a social anthropologist, a toxicologist, a statistician, and a public health veterinarian. Future plans call for the addition of a health educator and a safety engineer.

As originally conceived, the function of the institute is the demonstration and evaluation of public health problems of a rural nature. Activities of a control or regulatory nature are not considered a part of the institute program. A close working relationship has been established with the following groups and agencies: Iowa State Medical Society; Iowa State Department of Health; the Iowa Farm Bureau Federation; the School of Veterinary Medi-

cine, the School of Agriculture, the School of Engineering, and the Extension Service of Iowa State College.

Survey for Baseline Data

Our initial problem was lack of basic rural public health data. Limited available information served only to suggest probable or potential rural health problems. Epidemiological information on infectious diseases, accidents, and other suspect problems was nonexistent. In an effort to establish baseline information, an extensive rural health survey has been designed. It is expected this study will result in the recognition of specific problem areas. Future activities can then be designed to investigate these areas in detail.

Classical toxicology studies of hazards in the agricultural use of chemical products based on short-term animal experimentation are time consuming and expensive and their results questionable when applied to humans. The institute has established facilities to investigate the possibility of utilizing tissue culture techniques as a method of toxicological evaluation.

Accident prevention studies may be organized on an anthropological basis. Why do different ethnic groups, living in geographic proximity, engaged in the same tasks, and using essentially the same equipment, have significantly different accident rates? Why are certain groups of individuals willing and eager to use safety devices, while other groups refuse to consider the use of such items? To what extent are advances in agricultural mechanization responsible for accidents? These and similar questions may be answered by socioanthropological investigation.

Recent studies in this area indicate certain groups consider safety devices "sissyfied" and therefore unacceptable. In many areas it is considered quite reasonable not only to dispense with personal safety gear but also to remove these safeguards built into farm machinery. This is particularly true for cornpickers and power takeoff systems. The institute in collaboration with a local Iowa company has developed a cornpicker safety tool. A controlled field trial of this new tool, including a group acceptance study, is now in progress.

A study designed to investigate the differences between various groups in accepting routine immunization procedures has been completed. Families in the lower socioeconomic brackets were found to neglect routine immunizations when left to their own devices. Specific suggestions by the family doctor had little or no influence. However, such families were quick to participate in any sort of community-sponsored immunization program.

Zoonotic Patterns

Animal diseases are of importance to the health of rural people. Of the 115 diseases in this category, approximately 40 are known to occur in Iowa. Although classic epidemic disease patterns are infrequently observed in rural populations, epizootics of animal diseases may be expected to occur in rural areas. Recognition of an epizootic pattern is frequently the most efficient method of identifying a potential or existing human health hazard.

Leptospirosis constitutes a rural health hazard of unknown proportions. Repeated surveys in various parts of the United States have shown that 3 to 12 percent of the cattle population is serologically positive for leptospirosis (4-8). The incidence of leptospirosis in swine is thought to be considerably higher (5, 9). Relatively little investigational work has been done on human leptospirosis in Iowa. Serologic diagnostic facilities are unavailable at either the medical college or the laboratories of the Iowa State Department of Health.

Only recently have such facilities been established at the School of Veterinary Medicine. To gather baseline data on the incidence of human leptospirosis the institute now is testing all serum samples submitted to the laboratories of the State health department. The vast majority of these samples are submitted by practicing physicians for brucellosis testing. On the basis of some 3,000 such tests, approximately 2 percent are *Leptospira* positive. A similar survey of 1,000 premarital blood samples has resulted in the detection of only one positive specimen. Future activity in this area will be the routine investigation of all serums positive to *Leptospira*.

Q fever has been demonstrated as existing

in enzootic form in Iowa dairy cattle (10). Although less than 1 percent of the cattle appear to be infected, it is estimated that 3.5 percent of the dairy herds contain one or more infected animals. *Coxiella burnetii* has been isolated from the milk of serologically positive cattle. Preliminary human serologic studies show 8.5 percent of 200 Iowa veterinary practitioners to be Q-fever positive.

In cooperation with the State and Federal departments of agriculture, and the Iowa State Department of Health, an attempt is being made to investigate the possible relationship between tuberculosis in farmers and the occurrence of tuberculin-positive cattle. Particular attention is given the matter of tuberculin-positive cattle which appear to be free of lesions at slaughter inspection. This project is supported by a grant from the Iowa Tuberculosis and Health Association.

Iowa's poultry industry is rapidly expanding. Several cases of suspect human psittacosis due to domestic fowl contact have been investigated. The possibility that psittacosis is occurring in domestic fowl in Iowa is currently under investigation. This study comprises the routine screening of fowl serums for evidence of infection. A field trial of the antibiotic and millet seed preparation, as perfected by Dr. K. F. Meyer for the control of psittacosis infection in cage birds, has been completed. The product proved completely effective.

Rabies constitutes another serious problem in Iowa. Efforts have been made to isolate rabies virus from both normal and abnormal Iowa bats. All such efforts have proved unsuccessful to date. The fact that most barns house a bat colony serves to stimulate interest in this problem.

A project protocol has been written and an enabling grant received for the epidemiological investigation of toxoplasmosis. The results of preliminary studies indicate a high correlation between human toxoplasmin sensitivity and a history of routine animal contact. Of particular interest is the role of *Toxoplasma* in cases of degenerative retinitis in farmers.

Future research plans of the institute include a study of rural mental health. Iowa's suicide rate is 30 percent above the national average. Consideration is being given the matter of de-

layed or chronic sequelae of infectious diseases such as brucellosis. An attempt will be made to explore the effects and methods of rural health education.

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Perrott Retires

George St.J. Perrott, chief of the Division of Public Health Methods of the Public Health Service since 1939, retired June 30, 1958.

Director of the National Health Survey during 1935-36, he also directed the development of the National Health Survey established in 1957. Mr. Perrott has been associated with the direction of *Public Health Reports* since 1943 and was a major influence in the decision to convert the weekly edition to an expanded monthly journal in its present form. He has been managing director of *Public Health Reports* since 1952.

Mr. Perrott first joined the Public Health Service in 1933 as principal statistician. Previously, he served with the Bureau of Mines, where, from 1927-31, he directed the activities at the Pittsburgh Experiment Station, a research center for studies on health and safety in industry.

From 1917 to 1927, he was a chemist with the Chemical Warfare Service in Pittsburgh;

during a Washington assignment with the Warfare Service in 1918-19, he carried the rank of first lieutenant.

Recognized as a national authority in health statistics, Mr. Perrott received his education at the University of North Dakota and Princeton University. He is a member of the American Statistical Association.

Dr. William H. Stewart, special assistant to the Surgeon General for program operations since 1957, succeeds Mr. Perrott as chief of the Division of Public Health Methods.

Dr. Stewart was commissioned in the Public Health Service in 1951, serving as chief of the Epidemiological Unit of the Communicable Disease Center at Thomasville, Ga., during 1952 and 1953. After assignments with the Heart Disease Control Program in the National Heart Institute in 1953 and 1954, he was named assistant chief and then chief of that program in the Bureau of State Services. In 1956 Dr. Stewart became assistant director of the National Heart Institute.

With prevention of mental illness a goal and psychiatric time limited, this health department assigns supportive roles to nurses and consultative roles to psychiatrists. Cooperation with schools, official and voluntary agencies, and State mental hospitals aids in progress toward the goal.

A Health Department's Activities in Mental Health

H. L. BLUM, M.D., M.P.H., and W. A. KETTERER, M.D., M.P.H.

NEITHER a psychiatrist nor a psychiatric clinic was available in Contra Costa County, Calif., 10 years ago to handle the problems of emotional illness encountered by the Contra Costa County Health Department. During these years, we have sought to increase the staff's understanding of emotional illness, to promote better interpersonal relationships among members of the health department and other related groups, and to find the optimum use of psychiatrists and nurses in consultative and supportive roles. In addition, we have engaged in many community activities, such as family life education, to promote better mental health.

Contra Costa County, located east of San Francisco Bay, grew 300 percent between 1940 and 1950 to a total population of 299,000. By 1957, with growth continuing at a much slower rate, the population had reached 375,000. The health department was modest in size until 1950 when it began to expand, with services shaped to the community's needs. A decentralized working staff of sanitarians and nurses serve and represent the health department in specific geographic areas. In the county pat-

tern schools provide their own nurses, while the health department provides medical, dental, nursing, health education, sanitation, and other consultative services to any school desiring them.

Although the health department provides extensive clinic services, increasing industrialization and the spread of medical care insurance have somewhat decreased the problems of providing medical care. And, with health department emphasis on preventive rather than therapeutic medicine and encouragement of "whole care" in public and private practice, the actual ratio of population to clinic use has declined significantly in the past few years.

Initial Planning in Mental Health

In 1948, it became apparent that some of our persistently vexing problems in public health centered upon emotional illness. Three other county agencies felt similarly about many of their problems, and an informal meeting was arranged for representatives of the Contra Costa County welfare, school, probation, and health departments to consider creating a psychiatric or child guidance clinic. With our very limited means, it soon became clear that a clinic seeing so few patients would rapidly become saturated and its use to us would be minimal.

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Thus, a concept developed that mental health activities in the county would have to be more than a series of therapeutic situations between the psychiatrist and individual patients. We felt that a consultant psychiatrist could assist certain groups of professionally trained workers with mental health problems. The training of professional workers would result in the availability of many mental health services throughout the community on a scale quite impossible if the same limited psychiatric time were available only in a clinic situation. Therefore, arrangements were made for each agency to receive psychiatric consultation for one-half day a month. It was agreed to keep this experimental approach open to modification.

Development of the original scheme resulted in the inclusion of more county agencies in the psychiatric consultation program and the formation of the Mental Health Coordinating Committee of county agencies. Today, this committee comprises the department heads of nine different county agencies with whom a psychiatrist meets monthly. This body of administrators acts as a steering committee for the entire program, sets policy, plans, coordinates, evaluates, and determines allotment of time and financing. Broad framework is set up, but each agency has freedom in how it uses its share of psychiatric time. The total program involving all county agencies concerned in 1948 originally commanded 3 hours weekly from one psychiatrist. In 1958, there are 68 hours available from 9 psychiatrists.

In the beginning, after a few sessions of the health department with the psychiatrist we saw that we needed to learn how to deal with mental health problems and how they affected us personally. Staff members' personal problems relating to their job success called for consideration and understanding. For certain of our personnel, difficulties in work situations and interpersonal office relationships had to be remedied for more effective functioning within the staff, with other agencies, and with clients. It also became apparent that the staff members did not clearly understand their responsibilities or the goals they were trying to achieve.

Thus, through 1954, the psychiatrist served primarily as a consultant on administrative problems at various levels. The purpose here

was to ease interpersonal relations and to improve our understanding of emotional problems.

Nurses Assigned Patients

During 1954, the health department's opinion crystallized into the belief that the real need for psychiatric consultation lay in providing the nursing staff with the specific management techniques and didactic materials that would enable them to help their patients.

The health officer decided, without much group support and with some misgivings of the staff and the psychiatrists, that the majority of psychiatric time should be used to supervise, directly or indirectly, nurses who would be assigned emotionally disturbed patients. It was reasoned that the nurses would develop a better understanding of psychological procedures if they were confronted with a specific patient who had an acknowledged need for mental health guidance. Responsibility for an emotionally disturbed patient would plunge the nurse into actual work in this field. It was also reasoned that individual casework would provide good material for lectures and group discussions of the problems encountered.

Opponents reasoned that the plan would precipitate personnel into an assignment they were not prepared for. The health officer interpreted this argument as being almost a restatement of his own feelings that the years of discussions were simply postponing and probably encouraging avoidance of dealing with emotional problems.

The issue was resolved by the inception of our present system of public health nurse followup. In order to make such an extensive approach feasible, the department created the position of mental health nursing consultant and employed a public health nurse with special training.

Cases are chosen from among clients who come to the county hospital psychiatric unit, or from those found by the public health nurse among her district clients, and whose diagnosis indicates no frank psychosis or outstanding need for hospitalization. The patients chosen are often unable or unwilling to come to a psychiatrist, but can be visited in their homes or they can visit the public health nurse in her

district office. Assignments are made according to the client's place of residence; our public health nurses are generalized and have geographic districts. Each patient determined to be psychiatrically suitable is invited to a discharge conference attended by the field public health nurse and her supervisor, our mental health consultant, the psychiatrist, and the chief nurse of the hospital's psychiatric unit. After a professional discussion, the psychiatrist asks the patient to join the conference, introduces him, and holds a short interview for the benefit of the nurse. The patient then retires and the group completes its discussion.

This conference establishes a working diagnosis, explains the personality of the patient, indicates his past and expected behavior, and presents social, home, cultural, and economic factors. The nurse receives suggestions and recommendations regarding her relationship to the patient and the patient's environment, and has an opportunity to express her own feelings about the particular patient, whether they be inadequacy, fears, or conflicts. The psychiatrist can help the nurse understand her feelings. The conference enables the supervisor to understand the case and the feelings of the nurse, and to see how they are handled by the psychiatrist. It provides an opportunity for the supervisor to ask questions pertaining to her own role, the field nurse's plan for assistance, and related matters. The patient is given a chance to meet the nurse through the psychiatrist and to make an appointment for nursing visits.

If the public health nurse has additional problems during home or office followup, she returns to her supervisor for consultation. If the supervisor feels unable to assist, both turn to the mental health consultant, who spends approximately one-half of her time assisting the field staff and their supervisors with such cases. If necessary, the mental health consultant arranges for further interviews with the psychiatrist, who occasionally reevaluates the case. The mental health consultant also has 1½ hours a month for individual consultation with the psychiatrist.

The psychiatrist is also available every other month for a 1-hour meeting with each group of nurses and their supervisors in the six dis-

tricts and the mental health consultant. In addition, 2 hours are available monthly for the entire supervisory group and the nurse consultant. This time may be used to discuss cases presented from the field, whether previously seen by a psychiatrist or not, or to have the psychiatrist fulfill specific requests for lectures and discussion materials.

In 2 years, 1955 and 1956, approximately 250 cases were the subject of psychiatric consultation. Service ranged from a single visit to a series of 60 regular nursing home visits over the 2-year period. Although we are impressed with the results of extending the psychiatrist's services beyond direct contact with patients, we realize that only a small part of the total mental health problem is being touched with our field services.

As a result of this program, the public health nurses are generally satisfied that they are beginning to understand dynamic psychiatry and are putting it to use in their own actions and relationships to patients. Generally, it seems that acknowledging responsibility for services to emotionally disturbed persons is a marvelous learning experience. Prior to actual assignment of cases, didactic information and discussion had not really stimulated the nurses to positive action in dealing with cases of emotional disturbance that are inevitably part of their caseload. Some nurses, however, are not yet able to work with such cases or certain kinds of cases.

The district supervisors without case experience and the higher echelon of nursing supervision now desire the same opportunity. Five out of eight have requested and have been assigned disturbed persons. For theoretical and administrative reasons the supervisory groups should not lag behind the field personnel in understanding, and they also confer with the mental health consultant. It may well be that the top administrative ranks, including health officers, will wish to be assigned disturbed persons, serving what might be called psychiatric internships.

Responsibility for Program

At the same time that nurses were given the direct responsibility for assisting selected emotionally disturbed patients, the assistant health

officer in charge of venereal disease control was given responsibility for the mental health program. This physician is not a psychiatrist, but he has participated in the evolving programs during most of the 10 years and recently worked briefly on the psychiatric staff of a State hospital. In addition, he has been assigned to represent the department's non-nursing activities in community mental health. Under his direction a manual has been developed outlining the plans under way in each division of the health department and the role that each employee plays in the mental health program. We believe that official assignment adds prestige to the activities and provides a tangible means of direction, continuity, and evaluation.

Community Activities

In addition to the public health nursing activity in the emotionally disturbed cases, we are concurrently engaged in several community activities to promote mental health. We have augmented the maternal and child health programs, encouraged family life education courses, worked with voluntary agencies, and have developed a cooperative arrangement with the California State Department of Mental Hygiene, the agency responsible for the rehabilitation of county residents discharged from the State mental hospital.

Family Life Education

The foundation for mental health, much like the foundation for physical health, is laid early in childhood. Preventing mental ill health and creating a sound family life through family life education in the school are activities that take into account future generations. Many maintain that this is the responsibility of parents, but too few parents are adequately informed. Many are hesitant; others are unhappily married or do not have the time or the desire to provide this training. On the other hand, the careful integration of courses in family living, from kindergarten through college, can help in the creation of responsible parents whose children will be healthier mentally and more stable emotionally.

In 1953, a survey of all county schools revealed courses in family living were largely

absent, particularly in grade schools. Since that time, the health department has attempted to stimulate school administrators, parents groups, church groups, and others to plan family life education courses in schools. This is done by such means as teaching and assisting with films and reference materials. To expedite school and community acceptance of courses on human development, venereal disease, and similar topics, a professional person is sometimes needed. Thus, the assistant health officer in charge of mental health or persons chosen by him may be the initial lecturer. We regard the arranging of curriculum and teaching as a job for trained school personnel. No attempt is made to tell the school personnel how to give the course, nor do we teach, except as explained above. However, the assistant health officer offers guidance in areas to be covered. Whenever it appears that a particular school district has some interest in the topic, whether in elementary or secondary schools, the health department adds its weight to the movement.

Maternal and Child Health

Special mental health problems seem to cluster about certain groups in the population, many well known to the health department. Pregnant women constitute one of the major groups. In the maternal and child health program, both the clinic services and home calls to pregnancy cases are geared to a consideration of the special problems, particularly those of unwed mothers.

Another area of tremendous scope is our program for the newborn, the infant, and the preschooler. Here, the nurse through her home visits and the clinicians in well-child conferences have opportunities to work with special risk groups in allaying fears, offering advice, understanding parental anxieties, and paving the way for a more normal childhood. Our specialist director of maternal and child health supervises the clinicians. We have at times paid for and provided courses on growth, development, and emotional needs for these physicians. Rather than have a full-time specialist staff, we prefer employing part-time clinicians who are general practitioners in the community. Our objective has been to spread more of the mental health "know-how" among

the doctors through special training. We hope they will provide more preventive care to families in their own practices through their increased awareness and interest in foresighted guidance.

Other major programs are currently geared to consideration of the mental health aspects likely to be associated with the primary conditions for which the program was created.

Our crippled children's services offer opportunities for dealing not only with handicapped children but also with parents who experience rejection, guilt, inadequacy, unwillingness to go ahead, and related difficulties. Our tuberculosis and venereal disease programs particularly offer many challenges. Here again fears, guilt feelings, domestic problems, and potential socioeconomic losses are expected to engender or worsen emotional disturbances. In these, our nursing services in particular (to a lesser extent our clinic services) can be of great help. In many instances we have been of fundamental assistance to our clients in their emotional problems.

Assisting Voluntary Agencies

Nationwide, a great need is recognized for public education and support in mental health. Voluntary citizens groups and associations are major means of realizing these goals. Recognizing this, our health department stimulates and assists many organizations dealing broadly with mental health or various facets of it. Responsibility for this endeavor rests largely with the assistant health officer in charge of the mental health program. It has also been shared by the health officer and by the assistant health officers (particularly those in charge of maternal and child health, crippled children's services, and school health), health educators, and the public health nursing staff.

Characteristically, the organizations dealing with mental health have been small, with limited budgets, personnel, and activities. The health department participates in organizing, developing programs, and forming policy. Clerical assistance, health education materials, and press releases are provided during crises, especially in the early development of a voluntary agency. Usually the department does not provide "legwork" for voluntary agencies, since

we feel they can promote their cause better when their services are carried out by participating volunteers.

Members of the health department's staff are often members of the board of directors or committees of an agency and frequently are on the speaker's bureau. However, staff members do not accept executive positions such as president or chairman of a voluntary agency or its committees. We believe community voluntary workers should formulate a truly community program and avoid the possibility of being dominated by official agencies or of becoming an "arm" of the health department.

Since we must spread ourselves thin by participating in many voluntary agencies, we are constantly aware of the importance of assessing the value and goals of each agency in relation to the mental health and the total health picture. We attempt to devote our limited time to programs in which the most can be accomplished, preferably with the smallest investment of time and money. An example is our extensive participation in the Contra Costa-Alameda Epilepsy League. In our area, epilepsy is still neglected medically and shunned socially, and epileptics are rejected by schools and employers. The condition is comparatively easy and inexpensive to control, but does not receive a fraction of the attention justified compared with poliomyelitis or cerebral palsy, each of which it outnumbers sixfold.

Cooperating With the State

In the sphere of rehabilitation, we now work with the psychiatric social worker from the California State Department of Mental Hygiene, who has the legal responsibility for followup and rehabilitation of county residents discharged from the State mental hospital system. Our health department's role is primarily one of nurse cooperation. The nurse has a supportive relationship with some families and assists with the material needs of the discharged patient and his family.

The distances of the State hospitals from Contra Costa County have precluded a more direct relationship to date. However, our mental health consultant has established mutually helpful relationships with the nearby Berkeley outpatient clinic of the State Department of

Mental Hygiene. Previously, the health department and other agencies of the community referred cases there but immediately lost contact. We neither profited from the therapeutic experiences nor did we contribute in any way. Now we are able to furnish a more pertinent summary of findings and background on the patient and his family when we refer patients. In turn, the outpatient clinic provides the health department with pertinent information on these patients. The clinic, which has no home visiting services, has the benefit of our psychiatrically oriented staff.

Discussion

Certain basic tenets were assumed in determining the framework of the original mental health program.

1. Emotionally disturbed persons brought to an agency's attention are often in a phase of exacerbation and have passed through a prior phase in which the illness was less severe or fixed, but nevertheless under way (1).

2. It should be easier to reach such persons therapeutically at a time when their illness is less fixed, when they and others in their environment are less pessimistic in attitude. Presumably, at this time they can be assisted with a lesser expenditure of limited psychiatric resources (2).

3. It should be possible to provide many persons in the early stages of their disturbances with a supportive relationship through their contact with workers who are not psychiatrists but are employed by agencies whose work unveils emotional implications. If these workers are well indoctrinated in psychiatric principles and can work with psychiatric guidance, they should be able to accomplish a great deal. A. D. Schwartz, in an unpublished paper, calls them "caretaker persons" and points out that they may exist in or out of agencies or organizations. Those in agencies should be easier to mobilize.

4. It should be possible to utilize the services of a high proportion of professional people such as school guidance workers, probation caseworkers, social welfare workers, medical social workers, public health nurses, teachers, and others. This group numbers about 1 percent of the general population and 2 percent of the

adult population and has a large number of public contacts as well as some psychological orientation.

5. It might be possible to transmit continuously a significant amount of psychiatric understanding and working know-how from the psychiatrist to these field workers. This would probably be most successful if the information were mediated by another small but strategically placed group of workers who are equipped with significant psychiatric skills. These are the psychologists, psychiatric public health nurses, and psychiatric social workers.

Restated, the field worker in a supportive relationship with many disturbed persons would work closely with skilled intermediaries who in turn would deal directly with the psychiatrist. In this way the limited services of a psychiatrist could be extended through many professional workers or "caretakers" to a great number of their contacts. We have called this the "trickle down" approach.

The team headed by a psychiatrist has to develop an appreciation of community problems, socioeconomic groups, cultural patterns, organizations, and governmental agencies. Through an extensive training program (which we think should include closely supervised work with a limited number of clients), the psychiatrist helps train several echelons of mental health workers. The more psychiatrically skilled of these (in the health department, this would be the nurse mental health consultant) would primarily assist him by acting as consultants to the field workers. The field workers promote mental health concepts through the use of specific preventive techniques geared to the various groups of their "at risk clients." The field workers learn early to recognize emotional problems near their inception. The workers handle cases when they feel capable and refer more difficult ones to higher echelons. When a nurse assists in rehabilitating a posthospital or clinic patient referred to her, she receives instructions from the psychiatrist in order to achieve optimal family and community adjustment and acceptance for the patient.

Field personnel have many contacts with personal health problems and defects revealed by screening procedures or law enforcement activities. If clients are approached suitably, the

agency's goals are more likely to be achieved, and anxiety-producing situations are minimized. The worker's growth and increased skills in interpersonal relations enable him to avoid recalcitrancy, and possibly enable him to prevent violations of the law that result in legal prosecution with its antisocial and mental health consequences for the individual and his family.

Appreciation by the oriented worker of the need to define choices clearly for the potential law violator or victim of disease can be the stimulus for healthy decisions and the patient's moral growth. Our health department has seen successful contacts alter the attitude of fairly well-confirmed antisocial persons and apparently help reincorporate them into the community. By contrast, we have maneuvered persons into becoming hostile recalcitrants, even though they have really never before come afoul of basic community requirements.

Among the benefits that were foreseen in well-planned, psychiatric indoctrination was the clarification of administrative relationships. The very necessary administrative hierarchy is automatically an imposition in a democracy and resentments, always difficult to overcome, block communications and lead to misunderstandings (3). Any improvements in the field worker's understanding and acceptance of the proper exercise of authority and worker-supervisor relationships should result in less ambivalent feelings at the field level about law enforcement and the functions to be accomplished with clients. In strengthening the worker's ability to win the client's cooperation, the accomplishment is much more gratifying. Well-established communication lines that permit the worker to transmit his thoughts about his client help the agency do its job.

We also find more understanding between agencies. Frequently dealing with the same families, agencies often follow upon one another's footsteps and interfere with one another's attempts to assist a client. An appreciation of another agency worker's policies, legal limitations, and problems is therefore essential. Each affects the client whose welfare and peace of mind, if properly promoted, can lead to the amelioration of his status or his dismissal from the category of "client." By mutual agreement, basic work with a family

can be assigned to the one agency worker most concerned. Success in this area involves extensive free-flowing communications. It is our feeling that our mental health program has paid for itself by keeping administration and worker lines of communication open.

For the price of inservice training, it has been possible to expedite the administrative duties and functions of the health department. Fixing responsibilities for our mental health program in addition to the inservice training has succeeded in interesting everyone in the emotional aspects of their services.

We also feel that we can extend the community psychiatric resources through public health nursing services. This has not been inexpensive, but examination of a few apparently successful case histories indicates that for a very few hours and dollars large individual community savings are achieved.

Cost is not the only factor. A clinic cannot serve some of the clients that we do because some persons are not adequately motivated to seek help from a psychiatrist or clinic, nor do they require hospitalization. A nurse's relationship with a patient can be more felicitous; for a patient initially is likely to be less awed by a nurse's presence than a doctor's. A nurse may also be accepted by persons who will not deal with anyone having a psychiatric label. At least in a few cases, it was only after a good many home visits by a nurse that the patient's attitude changed enough to induce him to avail himself of psychiatric services.

Summary and Conclusions

The Contra Costa County Health Department's mental health program, although incomplete and inadequate from the standpoint of the whole problem, has explored and incorporated several projects in prevention of mental illness.

Promotion of mental health is carried out in all our general programs, including those in sanitation. More specifically, our maternal and child health program is geared to this approach in prenatal, parental, and child guidance. Encouragement of family life education in schools is a similar activity.

Limitation of apparent disturbances are also of major concern in these programs and par-

ticularly in our crippled children's, tuberculosis, venereal disease, and chronic disease services.

Direct assistance to the emotionally ill and to those being rehabilitated during or following therapy is a specific activity of our mental health program.

We feel that the health department's limited use of a consulting psychiatrist, extensive use of a nurse mental health consultant, and reliance on field nursing for patient supervision is one successful approach in furthering mental health. Proper indoctrination and training enables our field staff to help with many lesser conditions and to recognize and refer the more severe to the more psychiatrically skilled. Utilization of professional "caretaker" personnel seems to be an economical and feasible way to get mental health services to a great number of persons, particularly when psychiatric services are minimal or absent.

Most of the nursing field staff did not work readily with families or individuals with mental health difficulties until given specific case assignments. Classes and case presentations became of more value once the nurses had specific

cases and needs. Heavy turnover of nursing personnel makes it unlikely that usual inservice training or course work can be expected to prepare the staff as successfully as actual case responsibility with good supervision and consultation under overall guidance of psychiatrists.

There was need to formalize our mental health activities into a specific program and to assign an assistant health officer as program director. The program's importance was thereby recognized and responsibility for direction, supervision, and evaluation was established.

Administrative improvements, intra-agency and interagency relationships have been a major consideration with particularly significant gains in the latter.

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- (2) Querido, A.: The Amsterdam psychiatric first aid scheme and some proposals for new legislation. *Proc. Roy. Soc. Med.* 48: 741-748, September 1955.
- (3) Stanton, A. H., and Schwartz, M. S.: *The mental hospital*. New York, N. Y., Basic Books, 1954.

Course in Laboratory Methods in TB Diagnosis

A course in laboratory methods in the diagnosis of tuberculosis is offered by the Microbiology Laboratories of the Communicable Disease Center, Public Health Service, Chamblee, Ga., in cooperation with the Service's Division of Special Health Services. The course, scheduled for October 20-31, 1958, and for January 26-February 6, 1959, is open to all grades of employed laboratory personnel who have the approval of their State health officers.

The training includes preparation of culture media, microscopy, cultural procedures, diagnostic use of animals, and testing of drug sensitivity. Students attending will be offered a "student extension service" for a period of 1 year following termination of the course.

No tuition or laboratory fees are charged. Reservations for this course should be made well in advance, since the size of each class is limited to 12.

Application forms may be obtained from the Laboratory Branch, Communicable Disease Center, Public Health Service, P. O. Box 185, Chamblee, Ga.

A study of referrals to public health agencies among 1,263 households showed that the majority of the time and patient-nurse contacts are devoted to the first patient, and usually less than two additional patients come from the same household.

Public Health Nursing Service Provided in Households

MARION FERGUSON, R.N., Ph.D., and MARY ELLEN PATNO, Ph.D.

THE AMOUNT of public health nursing service needed by patients under the care of local health departments has been the subject of much speculation, the topic of many conferences, formal and informal, and the research objective of various studies. This report deals with one aspect of the problem—the amount of public health nursing service that ensues in a household as a result of the referral of the first patient.

Source of Data

The basic data for this report were collected by 2 nurses in each of 8 health agencies in 5 States over a period of 2 years. The agencies were the Frederick County Health Department, Maryland; Detroit Department of Health and Washtenaw County Health Department, Michigan; Rochester Health Bureau and Tompkins County Health Department, New York; Forsyth County Health Department, North Carolina; and the Fredericksburg Health District and the Community Nursing Service of Richmond, Virginia.

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These agencies met the criteria of the American Public Health Association for health department programs, and the nurses fulfilled the criteria of the American Nurses' Association and the National League for Nursing for public health nursing programs, staffing patterns, and basic public health nursing preparation of the staff. These agencies and nurses also were ones that, in the professional judgment of the responsible State health officials, were maintaining standards of good public health practice (1).

Households in this study comprised all persons living in one dwelling unit, such as an apartment or a private dwelling, but did not include family members living elsewhere. Beginning with referrals on February 1, 1954, each nurse admitted for study the households of the first 10 patients referred in each category of service where the agency assumed responsibility. Thereafter, she recorded, among many other items, the amount of service provided to all members of the household from the time of referral to discharge or for a period of 1 year, whichever came first.

The participating agencies provided services in all areas usually considered health department responsibility, but the number and type of categories used in reporting service varied considerably from agency to agency. Because

of this variation, all initial patients and their corresponding households were reclassified by the study staff for purposes of uniformity. As a result, some categories used in this report have more than 160 initial patients and households. Many have fewer than 160 initial patients, partially because of the reclassification, but mainly because fewer than the desired number of patients were referred to the individual nurse during the year when field data were collected.

In all, 1,263 households were studied. They included 5,779 members, 2,984 of whom received service from the public health nurse. Forty-two percent of the initial patients in these households were referred for nursing service by various divisions of the health department itself. Private physicians and hospitals referred 22 percent, while the patient or his family accounted for 16 percent. School referrals amounted to 11 percent; all other sources, 9 percent.

For tuberculosis, infant health supervision, and maternity, most referrals came from the health department. The patient and family were also frequent sources of referral for maternity and infant health supervision. Referrals from physicians were more numerous in noncommunicable disease, chronic illness, and tuberculosis than in other categories. The school referrals were mostly of school-age children for physical defects or for behavior or emotional problems.

Index of Additional Patients

Referral of the initial patient in a household has been assumed to lead to service for other members of the family. This is one of the bases for advocating generalized public health nursing service. In this study, service to other members of the households is demonstrated by the ratio of the number of additional patients to the number of initial patients. The resulting index simply describes the average number of added patients per a first referral.

The index of additional patients varies from one service category to another (table 1). When the initial referral was classified as tuberculosis, the index was 2.0 which means that, on the average, 2 patients in addition to the initial patient in the household received service. This was the

highest index. The lowest index, 0.5, occurred when the initial referral was venereal disease.

The magnitude of the index, or the number of additional patients per household, appears to be virtually independent of the size of household and related primarily to the category of the initial patient. For example, households initially admitted as tuberculosis averaged 4 members, 77 percent of whom became patients (index 2.0). In the mental health category, however, households were larger on the average, 4.7 members, but only 38 percent of the members became patients (index 0.8).

The index based on all households and their patients has been omitted purposely from table 1. The households studied were not selected with the view that they would reflect a total caseload. They were selected, instead, to reflect what occurred within a service category. Consequently, all figures derived from the basic data must be considered by category only.

Service Categories of Additional Patients

When service categories were considered separately, additional patients were usually in categories different from that of the initial patient (table 2). The greatest exception was in the tuberculosis category where 82 percent of the added patients were also classified as tuberculosis. This exception is easily understood because the category includes suspects and contacts as well as cases of tuberculosis. Similarly, 58 percent of the additional patients resulting from a venereal disease referral and 42 percent of those from a communicable disease referral were in the same category as the initial patient.

Subcategories in health supervision are determined by the age of the patient. This accounts for most of the additional patients being in a different group than that of the initial patient. For example, only 3.7 percent of the additional patients resulting from an initial referral for infant health supervision were in the same category. This is to be expected. Few households include two infants simultaneously or over a short period of time.

Because of the age factor in health supervision and because child health supervision is usually associated with maternity service, a broader grouping including health supervision

and maternity was made. With these categories grouped, 89.5 percent of the additional patients were in this larger category.

Patient-Nurse Contacts

In previous studies, terms such as interview, visit, and conference have been used to identify

the services given by the public health nurse to or in behalf of the patient. Because specific and often diametrically opposed definitions of these terms have been developed to meet particular needs in various situations, they are not used in this report. Instead, a term "patient-nurse contact" (PNC) has been employed. This term covers all services to or in behalf of the

Table 1. Index of additional patients

Category of initial patient	Average household size	Number of initial patients (households)	Number of additional patients	Percent ¹ patients	Index ²
Orthopedic.....	4.8	64	67	42.4	1.0
Chronic disease ³	3.7	126	89	46.1	.7
Communicable disease.....	5.3	92	102	39.9	1.1
Tuberculosis.....	4.0	178	365	76.6	2.0
Venereal disease.....	3.7	36	19	41.7	.5
Infant.....	4.7	230	348	53.7	1.5
Preschool.....	5.3	47	81	51.2	1.7
School.....	5.3	71	64	36.1	.9
Adult health.....	5.5	4	7	50.0	1.7
Antepartum.....	5.1	160	279	54.2	1.7
Postpartum.....	4.6	111	183	57.9	1.6
Mental health.....	4.7	71	55	38.0	.8
Noncommunicable disease.....	4.2	73	62	44.4	.8

¹ Total patients in household/total persons in household.

² Number of additional patients/number of initial patients.

³ Includes cancer, cardiovascular, and other chronic diseases.

Table 2. Relation of category of additional patients to that of initial patient

Category of initial patient	Number of initial patients	Additional patients in households				
		Total	Same category as initial patient		Different category from initial patient	
			Number	Percent	Number	Percent
Health supervision and maternity service.....	623	962	861	89.5	101	10.5
Infant.....	230	348	13	3.7	335	96.3
Preschool.....	47	81	22	27.2	59	72.8
School.....	71	64	7	10.9	57	89.1
Adult health.....	4	7	1	14.3	6	85.7
Antepartum.....	160	279	3	1.1	276	98.9
Postpartum.....	111	183	0	0	183	100.0
Communicable diseases.....	306	486	360	74.1	126	25.9
Tuberculosis.....	178	365	298	81.6	67	18.4
Venereal disease.....	36	19	11	57.9	8	42.1
Others.....	92	102	43	42.2	59	57.8
All others.....	334	273	59	21.6	214	78.4
Chronic disease ¹	126	89	9	10.1	80	89.9
Orthopedic.....	64	67	3	4.5	64	95.5
Noncommunicable disease.....	73	62	10	16.1	52	83.9
Mental health.....	71	55	9	16.4	46	83.6

¹ Includes cancer, cardiovascular, and other chronic diseases.

Table 3. Patient-nurse contacts per household referral

Category of initial patient	Number of patient-nurse contacts per household					Percent	
	Total	Initial patients	Additional patients	Average for each additional patient	Ratio initial patient to additional patients	Initial patient	Additional patients
Orthopedic.....	14.3	10.8	3.5	3.3	3.3	75.5	24.5
Chronic disease ¹	24.8	21.5	3.3	4.6	4.7	86.7	13.3
Communicable disease.....	12.3	6.0	6.3	5.7	1.1	48.8	51.2
Tuberculosis.....	23.5	14.2	9.3	4.5	3.2	60.4	39.6
Venereal disease.....	7.9	6.0	1.9	3.6	1.7	75.9	24.1
Infant.....	11.2	6.3	4.9	3.3	1.9	56.2	43.8
Preschool.....	11.7	4.7	7.0	4.0	1.2	40.2	59.8
School.....	11.7	7.5	4.2	4.7	1.6	64.1	35.9
Adult health.....	17.5	11.0	6.5	3.7	3.0	62.9	37.1
Antepartum.....	19.2	10.7	8.5	4.9	2.2	55.7	44.3
Postpartum.....	13.5	5.0	8.5	5.1	1.0	38.5	61.5
Mental health.....	15.4	11.6	3.8	4.8	2.4	75.3	24.7
Noncommunicable disease.....	13.9	10.7	3.2	3.7	2.9	77.0	23.0

¹ Includes cancer, cardiovascular, and other chronic diseases.

patient, regardless of the place of service (such as home, office, or clinic), the other person involved (such as patient, social agency representative, or physician), or the means (such as home call, telephone, or letter).

The number of patient-nurse contacts was considered by household, initial patient, additional patients as a group, and individual additional patients (table 3). This table shows that the greatest number of PNC's to a household (24.8) occurred when the initial referral was classified as cancer, cardiovascular disease, or other chronic disease. Also, 87 percent of the patient-nurse contacts in this group were for the initial patient. At the other extreme, only 7.9 PNC's per household were made when the initial referral was classified as venereal disease.

One special point of interest is found in the field of child health supervision. When only the total PNC's to a household are considered, the age of the initial patient makes little difference. When the initial patient was an infant, 11.2 patient-nurse contacts per household were recorded; when a preschool or school child was referred, 11.7 PNC's were made.

In all but three categories (communicable disease, preschool health supervision, and postpartum), the initial patient received more than half of the total PNC's. Furthermore, in all categories except one (postpartum) the average number of patient-nurse contacts to initial

patients exceeded the average number for individual additional patients. In fact, in seven categories, the average number of PNC's to the initial patient was more than double that for individual additional patients. In the postpartum category, the initial patients averaged 5.0 patient-nurse contacts and additional patients, practically all of whom were children, averaged 5.1 (table 3).

Whether reporting under study conditions differs from routine reporting is always a question in any study such as this. A limited answer to this question was obtained by pooling the annual reports of the participating agencies and comparing these data with those of the study. The annual reports provided the number of patient-nurse contacts per patient in the home setting. Similar averages were

Table 4. Home patient-nurse contacts per patient

Category of service	Study	Pooled annual reports
Chronic disease, orthopedic, and noncommunicable disease.....	7.6	8.6
Communicable disease and venereal disease.....	2.8	2.1
Tuberculosis.....	3.8	4.0
Maternity.....	4.4	3.0
Health supervision.....	3.4	3.2

obtained from the study data on contacts occurring in the home (table 4). A comparison of the several averages suggests that the number of patient-nurse contacts in the home was neither over-reported nor under-reported by the nurses who provided the basic data.

Time for Patient-Nurse Contacts

Time spent in giving nursing service is even more important than the frequency of service in relation to an agency's personnel needs or the setting of priorities within an agency. In this study, nurses reported the time required for actual service. Travel time was excluded because it varies with local geography and means of transportation. The time reported included both preactivity and postactivity as well as the time spent in giving direct service. In other words, total time included that spent in reviewing the patients' records, collecting literature or other supplies, packing nurse's bag, recording on the patients' records, and similar activities, as well as the time spent with the patient.

Time per household ranged from 2.3 hours for households where the initial referral was for venereal disease to 10.7 hours for those where the first referral was for cancer, cardiovascular disease, or other chronic disease (table 5). As might be expected the extremes for time

spent in direct service and in preactivity and postactivity were also found in these two categories, since any direct service requires a certain amount of preactivity and postactivity.

The proportion of time spent in direct service was fairly constant from one category to another, even though there was great variation in the amount of direct service. It ranged from 68 percent in households in the postpartum category to 76 percent in households in the category of cancer, cardiovascular disease, and other chronic disease.

Except for the postpartum and preschool categories, the initial patient received more than half of the time given to the household. The initial patient also received more time, on the average, than any individual additional patient except those in the postpartum category.

Comparison of tables 5 and 3 shows that the difference in the amount of service given to the initial patient and that to the additional patients is even more marked when time is considered rather than frequency of service.

Combination Agencies and Health Departments

Combination agencies have been defined in the National League for Nursing's Public Health Nursing Achievements and Goals as "a service jointly administered and jointly financed by official agencies (including boards of education)

Table 5. Hours of nursing service per household

Category of initial patient	Hours							Percent	
	Total	Pre- and post-activity	Direct service	Initial patient	Additional patients	Average for each additional patient	Ratio initial patient to additional patients	Initial patient	Additional patients
Orthopedic.....	5.0	1.3	3.7	4.0	1.0	1.0	4.0	80.0	20.0
Chronic disease ¹	10.7	2.5	8.2	9.8	.9	1.3	7.5	91.6	8.4
Communicable disease.....	3.9	1.1	2.8	2.3	1.6	1.4	1.6	59.0	41.0
Tuberculosis.....	6.8	1.6	5.2	4.7	2.1	1.0	4.7	69.1	30.9
Venereal disease.....	2.3	.7	1.6	1.8	.5	1.1	1.6	78.2	21.8
Infant.....	4.4	1.4	3.0	2.7	1.7	1.1	2.5	61.4	38.6
Preschool.....	3.5	1.0	2.5	1.5	2.0	1.2	1.2	42.8	57.2
School.....	3.5	1.0	2.5	2.2	1.3	1.4	1.6	62.8	37.2
Adult health.....	5.0	1.4	3.6	3.7	1.3	.7	5.3	74.0	26.0
Antepartum.....	7.3	1.9	5.4	4.5	2.8	1.6	2.8	61.6	38.4
Postpartum.....	5.3	1.7	3.6	1.9	3.4	2.0	1.0	35.8	64.2
Mental health.....	6.0	1.8	4.2	4.7	1.3	1.8	2.6	78.3	21.7
Noncommunicable disease..	5.1	1.3	3.8	4.2	.9	1.1	3.8	82.4	17.6

¹ Includes cancer, cardiovascular, and other chronic diseases.

and voluntary agencies, with all field service rendered by a single group of public health nurses" while health departments are entirely tax supported.

These agencies differ in their policies as to the types and extent of the nursing service they provide.

Combination agencies assume more responsibility for long-term nursing care of the sick and disabled than do health departments. The combination agencies give nursing care of the sick and disabled as part of a continuing nursing service in homes, while health departments usually give such care only on a demonstration basis.

Because of differing policies, the data were examined according to the type of agency providing care (table 6). In general, the 3 combination agencies reported a few more additional patients than did the 5 health departments. Also, with the exception of venereal disease and child health supervision, the combination agencies reported more patient-nurse contacts per household. Finally, more time was spent by the combination agencies per household in every category except noncommunicable disease.

Summary and Discussion

In this study of 1,263 households and the public health nursing service they received,

three measurements have been used to describe the amount of service that ensues in a household as a result of the referral of the first patient. The first was the average number of additional patients per initial referral. This index was found to vary considerably with the service category of the first patient, and also appears to be virtually independent of the household size. In all service categories except tuberculosis, fewer than two additional patients were served per initial referral.

The second measurement was the number of patient-nurse contacts per household; the third, the number of hours spent in nursing service per household. Both of these measurements varied with the category of the initial patient and the variation was somewhat the same for the two measurements. This consistency in the variation was closely related to the fact that in most categories the initial patient received the majority of the patient-nurse contacts and the greater proportion of the time expended.

Time spent in preactivity and postactivity was studied as well as time spent in direct service to the patients. In all categories indirect service accounted for approximately 25 percent of the time expended, indicating that actual time with a patient or household is not the best measure for a work unit. A better one also takes into account the time spent for indirect service.

Table 6. Combination agencies and health departments

Category of initial patient	Number of initial patients		Index of additional patients		Patient-nurse contacts per household		Hours of service per household	
	Combination agency	Health department	Combination agency	Health department	Combination agency	Health department	Combination agency	Health department
Orthopedic.....	12	52	1.4	1.0	12.8	14.6	5.2	5.0
Chronic disease ¹	54	72	.8	.6	27.5	22.7	14.2	8.1
Communicable disease.....	44	48	1.1	1.1	13.6	11.2	3.9	3.9
Tuberculosis.....	57	121	2.1	2.0	27.1	21.8	7.8	6.4
Venereal disease.....	8	28	.0	.7	7.1	8.1	3.0	2.2
Infant.....	67	163	1.4	1.6	10.8	11.4	4.4	4.3
Preschool.....	20	27	1.7	1.7	10.9	12.2	3.9	3.3
School.....	21	50	1.1	.8	10.7	12.2	4.1	3.2
Adult health.....	2	2	2.5	1.0	22.0	13.0	7.2	2.9
Antepartum.....	61	99	1.9	1.6	22.8	16.9	8.4	6.7
Postpartum.....	43	68	1.6	1.6	16.1	11.8	5.6	5.1
Mental health.....	15	56	1.5	.6	16.2	15.2	6.7	5.9
Noncommunicable disease.....	41	32	1.0	.7	12.5	15.7	5.0	5.3

¹ Includes cancer, cardiovascular, and other chronic diseases.

The study staff made an effort to select those agencies and nurses that represented good public health nursing practices. If this was accomplished, the data presented in this report might be used in estimating personnel needs.

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Radioactivity Study

Milk samples have been analyzed for specific radionuclides in a continuing study conducted by the Public Health Service in milksheds serving Sacramento, Salt Lake City, St. Louis, Cincinnati, and New York City. Analyses to date find that manmade radioactivity on the average is but a small fraction of the recommended permissible maximum and is but slight even in relation to the natural radioactivity of milk. The study, which began in April 1957, is part of the Service's broad program in environmental analysis, including tests for radioactivity in water, air, and food.

Milk was the food selected for the initial study because of its importance in the diet and its year-round and widespread production. Radiation may be measured as a total or gross level, or it may be broken down to show the level of radiation from each specific radioactive element. Specific measurements, although much more difficult to make, are important because health effects vary greatly among specific elements. In addition, because milk normally contains natural radioactive potassium, the study undertook the separate measurement of radiation from specific manmade nuclides.

With the cooperation of State and municipal health agencies and the dairy industry, a monthly 1-gallon sample is collected at a designated point in each milkshed. The sample is a composite of a day's delivery by a group of dairy farms.

The sampling points were set up by the Service's

regional milk and food consultants in accordance with the following criteria:

- The milk in each composite sample must be from a group of farms having, altogether, at least 1,000 cows.
- The number of individual farms in the sample must be small enough to make collection of field data on each farm feasible.
- The composite milk sample must be from a supply that is part of a major metropolitan milkshed.
- The conditions under which the milk is received must be such that milk from the same production area is represented in the composite sample collected each month.

Collateral information also is collected concerning feeding practices, water supplies, and breeds of dairy cattle typical of each area.

The average levels of radioactivity found in samples collected during the first year of the pilot program are expressed here in units of micromicrocuries per liter of milk. A curie is a measure of radioactivity equivalent to that produced by one gram of radium, and a micromicrocurie is one-millionth of a millionth of a curie. The levels are shown in the table.

Additional sampling points are being established in the milksheds serving Atlanta, Ga.; Fargo, N. Dak., and Moorhead, Minn.; Austin, Tex.; and Spokane, Wash; and in a milkshed in southern Wisconsin.

First year's average levels of radioactivity in milk samples (micromicrocuries per liter)

City	Calcium (grams/ liter)	Iodine-131 (3,000)	Strontium- 89 (7,000)	Strontium- 90 (80.0)	Barium-140 (200,000)	Cesium-137 (50,000)
Sacramento.....	1. 128	35	14. 7	3. 4	19. 5	32. 8
Salt Lake City.....	1. 137	274	34. 0	3. 8	54. 0	43. 7
St. Louis.....	1. 250	275	78. 3	7. 4	98. 5	40. 3
Cincinnati.....	1. 254	132	45. 4	5. 1	39. 2	27. 3
New York City.....	1. 076	82	42. 4	5. 8	46. 8	29. 7

NOTE: Numbers in parentheses are the maximum permissible concentrations for the specific nuclides in drinking water recommended by the National Committee on Radiation Protection and Measurement.

Status of Controlled Fluoridation in the United States, 1945-57

OF THE approximately 118 million people in the United States provided water by community water supplies in 1957, 40.3 million (or about 1 in every 3 persons) in 3,534 communities drank water containing the minimum or higher level of fluoride recommended for optimum dental benefits.

Of these 40.3 million persons, 33.3 million in 1,631 communities are supplied water in which the fluoride level is controlled, and 7 million in 1,903 places use water naturally containing 0.7 ppm or more fluoride. Since 1950, the number of persons using water with a controlled fluoride content has increased by about 32 million (table 1 and fig. 1).

Controlled Fluoridation

Fluoridated water is provided for a greater proportion of people living in large cities than in smaller communities (table 2). A majority of the Nation's cities having populations of a half million or more (12 of the 18) provide fluoridated water. These cities are:

Chicago, Ill.	San Francisco, Calif.
Philadelphia, Pa.	Pittsburgh, Pa.
Baltimore, Md.	Milwaukee, Wis.
Cleveland, Ohio	Houston, Tex.
St. Louis, Mo.	Buffalo, N. Y.
Washington, D. C.	Minneapolis, Minn.

Two of the five cities with populations exceeding 1 million (Chicago and Philadelphia), and 9 of the 13 cities with populations ranging between a half million and a million have in-

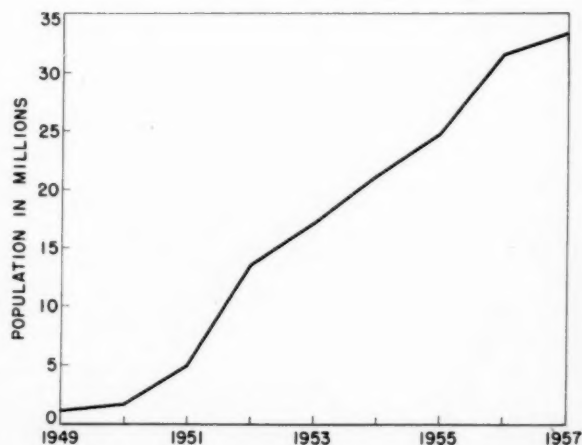
stituted fluoridation. Of these 13 cities, only one, Houston, Tex., provides water which naturally contains fluoride at a level of 0.7 ppm.

Of places with less than a half million population, 32 percent of those with a population between 10,000 and 500,000, 17 percent between 2,500 and 10,000, and 5 percent under 2,500 have fluoridation programs (fig. 2).

The authority by which fluoridation is instituted is of interest. In 82 percent of the cities fluoridating, the governing body of the community authorized adoption of the measure. In 5 percent authority to fluoridate was obtained by referendums, and in 4 percent the utilities commission authorized the measure. Nine percent of the communities did not specify authority or used other procedures in adopting fluoridation.

Fluoridation was discontinued in 13 communities providing water to 192,000 people

Figure 1. Population served with water to which fluoride has been added, 1949-57.



*Prepared by the Division of Dental Public Health,
Bureau of State Services, Public Health Service.*

Table 1. Cumulative changes in status of fluoridation, by year, 1945-57

Year	Fluoridation status at end of each year			Fluoridation discontinued ¹			Fluoridation reinstituted after discontinuance		
	Number communities	Number water supply systems	Population ²	Number communities	Number water supply systems	Population ²	Number communities	Number water supply systems	Population ²
1945.....	6	3	231, 920						
1946.....	12	8	332, 467						
1947.....	16	11	458, 748						
1948.....	24	13	581, 683						
1949.....	46	29	1, 062, 779						
1950.....	96	62	1, 578, 578	1	1	16, 550			
1951.....	339	171	4, 948, 259	2	2	29, 450			
1952.....	717	353	13, 552, 501	7	7	202, 122			
1953.....	965	482	17, 080, 930	14	14	253, 738	2	2	166, 466
1954.....	1, 147	571	21, 208, 304	36	34	1, 323, 613	4	4	170, 400
1955.....	1, 300	668	24, 796, 043	64	52	1, 717, 653	6	6	184, 372
1956.....	1, 521	765	31, 584, 408	81	65	1, 905, 735	10	10	222, 741
1957.....	1, 631	870	33, 294, 899	94	69	2, 097, 955	13	13	289, 081

¹ Total whether or not reinstituted.

² Most recently available population figures were used regardless of the year that fluoridation was instituted.

during 1957. During the same year, 3 communities, providing water to 66,000 people, reinstituted the measure after having previously discontinued it. During the years 1945 to 1957, a total of 94 communities discontinued fluoridation; of these, 13 reinstituted the measure (table 3).

Water supply systems are publicly owned in 84 percent of the communities in which the fluoride content is controlled. In cities with more than 500,000 people, 100 percent of the water systems are under public ownership. Eighty-eight percent of the systems are publicly owned in cities of from 25,000 to 500,000 population, 90 percent in places from 10,000 to 25,000, and 82 percent in places under 10,000.

Future Growth

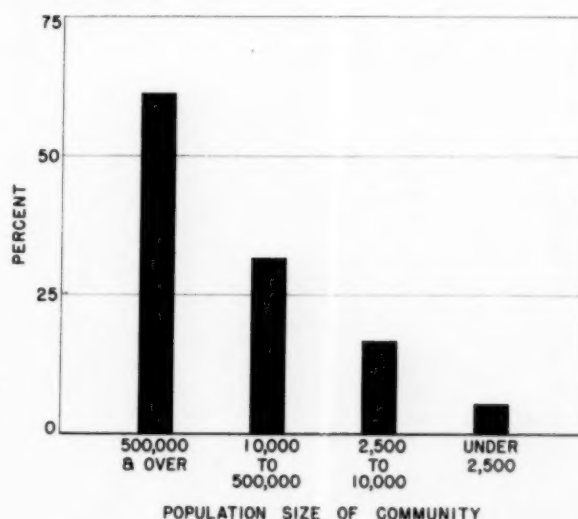
The major increases in the population provided with fluoridated water during the next few years is likely to be in the larger cities. However, in the more distant future the greatest increase will probably be in the smaller places where today only 5 percent have fluoridation programs. It is in towns of 2,500 or less that fluoridation will need to make its greatest advances.

Although fluoridation continues to be a mat-

ter of public discussion in certain parts of the country, there has been a decline in the number of communities discontinuing fluoridation over the past several years. The number of water supply systems discontinuing fluoridation in 1954 to 1956, for example, was 3 to 5 times greater than in 1957.

Interest in fluoridation programs in other countries is mirrored in the endorsements of re-

Figure 2. Percentage of communities fluoridating their water supplies, by size, December 31, 1957.



sponsible health officials the world over. Controlled fluoridation programs are in operation in one or more communities in the following countries: Australia, Brazil, Canada, Chile,

Colombia, Costa Rica, Egypt, England, Germany, Guatemala, Japan, the Netherlands, New Zealand, Panama, Panama Canal Zone, Peru, Philippines, Scotland, and Sweden.

Table 2. Communities using controlled fluoridation, ownership, and authorization, by size of place, December 31, 1957

Population size of community	Number of communities in urban and rural areas ¹	Communities using controlled fluoridation		Ownership			Authorization			
		Number	Percent of all communities of same size	Public	Private	Other and not specified	Governing body alone	Referendum	Utilities commission	Other and not specified
Total	18, 548	1, 631	8. 8	1, 373	196	62	1, 344	86	58	143
1,000,000 and over	5	2	40. 0	2			2			
500,000-999,999	13	9	69. 2	9			8	1		
250,000-499,999	23	7	30. 4	6	1		7			
100,000-249,999	65	21	32. 3	18		1	18			3
50,000-99,999	126	47	37. 3	40	6	1	41	3		3
25,000-49,999	252	82	32. 5	74	7	1	73	2	2	5
10,000-24,999	778	224	28. 8	202	15	7	187	19	5	13
5,000-9,999	1, 176	230	19. 6	194	31	5	192	13	4	21
2,500-4,999	1, 846	270	14. 6	226	28	16	220	11	5	34
1,000-2,499	4, 437	315	7. 1	262	35	18	259	10	10	36
Under 1,000	9, 827	² 424	² 4. 3	157	46	1	181	9	4	10
Not specified				183	25	12	156	18	28	18

¹ From U. S. Bureau of the Census: United States Census of Population: 1950, vol. I.

² Includes "Not specified."

Table 3. Changes in status of fluoridation, by year, 1945-57

Year	Net increase in fluoridation			Fluoridation discontinued ¹			Fluoridation reinstituted after discontinuance		
	Number communities	Number water supply systems	Population ²	Number communities	Number water supply systems	Population ²	Number communities	Number water supply systems	Population ²
Total	1, 631	870	33, 294, 899	94	69	2, 097, 955	13	13	289, 081
1945	6	3	231, 920						
1946	6	5	100, 547						
1947	4	3	126, 281						
1948	8	2	122, 935						
1949	22	16	481, 096						
1950	50	33	515, 799	1	1	16, 550			
1951	243	109	3, 369, 681	1	1	12, 900			
1952	378	182	8, 604, 242	5	5	172, 672			
1953	248	129	3, 528, 429	7	7	51, 616	2	2	166, 466
1954	182	89	4, 127, 374	22	20	1, 069, 875	2	2	3, 934
1955	153	97	3, 587, 739	28	18	394, 040	2	2	13, 972
1956	221	97	6, 788, 365	17	13	188, 082	4	4	38, 369
1957	110	105	1, 710, 491	13	4	192, 220	3	3	66, 340

¹ Total whether or not reinstituted.

² Most recently available population figures were

used regardless of the year that fluoridation was instituted.

A 1955 study demonstrates that the mere introduction of a highly virulent strain of poliomyelitis into a susceptible population is not enough to kindle a severe epidemic.

Poliomyelitis in Idaho After Use of Live Virus Vaccine

CARL M. EKLUND, M.D., E. JOHN BELL, Ph.D., and ROBERT K. GERLOFF, M.A.

FACTORS responsible for a poliomyelitis epidemic in the United States are not clear. Sporadic cases of poliomyelitis are reported every year and may be present at any season throughout the country. Epidemics, however, are geographically limited and are relatively infrequent. They have no apparent regularity but generally occur during the summer and early fall. It would appear that an epidemic should follow introduction of an especially virulent and invasive strain of poliovirus into a relatively susceptible population, but in an endemic area, it is not possible to establish the origin or introduction of such a strain.

An incident in Idaho during April 1955 gave an unparalleled opportunity to study a poliomyelitis outbreak. In that month two lots of commercially prepared vaccine were used to

immunize 32,000 children in the school program of the State. After the first series of inoculations, poliomyelitis appeared in the vaccinated children, and the immunization program was terminated. Subsequently, viable poliovirus of all three types was shown to be present in the vaccine lots used (1). The introduction of viruses into a human population at a known time and the ease with which subsequent events could be followed created a favorable environment for study of the epidemic.

Vaccine containing live virus was given at a time when poliomyelitis did not constitute a problem in Idaho. The vaccination program was conducted at least 2 months prior to the season when an increase in incidence would have been expected on the basis of past experience. Thus, polioviruses were introduced into a relatively susceptible population at a season which experience had shown to be unfavorable for the natural occurrence of poliomyelitis epidemics.

Idaho's first recorded poliomyelitis epidemic was in 1947, when 371 cases were reported. Other epidemics occurred during 1949 (510 cases) and 1952 (253 cases). In a population of approximately 600,000 people, 1,884 cases were reported during the 8-year period from 1947 through 1954.

Our conclusions regarding conditions necessary for the occurrence of a poliomyelitis epi-

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demie are based primarily on data concerning the incidence of poliomyelitis in the recipients of two lots of vaccine used in Idaho, the infectivity of those individuals manifesting clinical disease, and the number of secondary cases that developed.

Methods

Attempts were made to obtain clinical and epidemiological data and selected specimens from all cases of poliomyelitis reported from the time of administration of the vaccine until January 1, 1956. Whenever possible, specimens were collected from family associates of patients with onset before October 1955. Blood specimens for serologic studies also were collected from 657 children in first and second grades 6 to 8 weeks after vaccination.

All specimens were examined by standard tissue-culture techniques in which epithelial cells from the kidneys of rhesus monkeys were used. Viruses were isolated in such cultures by inoculation of suspensions of certain tissues, sputum, or feces into bottles or tubes containing sheets of cells which had been incubated at 37° C. for 7 days. Agents producing typical cytopathogenic effects were identified by neutralization tests (2) with serums which had been produced at the Rocky Mountain Laboratory and used in a portion of the study conducted by the National Foundation for Infantile Paralysis during the evaluation studies in 1954. These examinations were made in the

same laboratory that had conducted the evaluation study in Montana in 1954.

Samples of the two lots of vaccine used in Idaho were supplied by the Idaho Department of Public Health, district health department directors, practicing physicians, and, in the case of one lot, also by the manufacturer. Monkeys and special tissue-culture methods were used to detect virus in these vaccines (1).

The number of cases accepted for inclusion in the study and the criteria for their selection are given in table 1 and figures 1-7. All paralytic cases with clinical data compatible with a diagnosis of poliomyelitis have been included. In some cases, however, no specimens were submitted for examination. Nonparalytic cases were excluded unless virus was isolated from specimens collected from the patient or from a family contact.

Of 167 cases accepted as caused by type 1 poliovirus, 149 were paralytic and 18 were nonparalytic. Virus was isolated from 97 patients and from 12 family contacts. Eighteen persons from whom virus was isolated did not display evidence of paralysis, whereas 91 manifested some degree of paralysis. In 33 instances in which virus was not isolated, diagnosis was based on the presence of diagnostic titers of type 1 antibodies. In the majority of cases a rise in antibody titer was not demonstrated. These cases are included, however, since it is well known that the immunological response is already far advanced by the time

Table 1. Idaho poliomyelitis cases in 1955 probably due to type 1 virus

Relation to vaccine	Type of case	Virus isolation		Antibodies		No specimens received ²	Total
		Patient	Family	Rise	No rise present ¹		
Poliomyelitis in vaccinated children.	{Paralytic.....	7	4	3	2	1	17
	{Nonparalytic.....	3	0	0	0	0	3
Poliomyelitis in contacts of vaccinated children.	{Paralytic.....	37	6	0	5	4	52
	{Nonparalytic.....	8	1	0	0	0	9
Poliomyelitis with no history of contact or onset after June 30.	{Paralytic.....	36	1	0	23	20	80
	{Nonparalytic.....	6	0	0	0	0	6
Total.....	97	12	3	30	25	167

¹ In all cases type 1 antibodies were present either alone or in conjunction with types 2 or 3 antibodies.

² These cases are included as probable type 1 poliomyelitis since there were so few isolations of type 2 or type 3 poliovirus from cases.

Figure 1. Poliomyelitis, type 1 and probable type 1, among children vaccinated on or after April 17, 1955, Idaho.

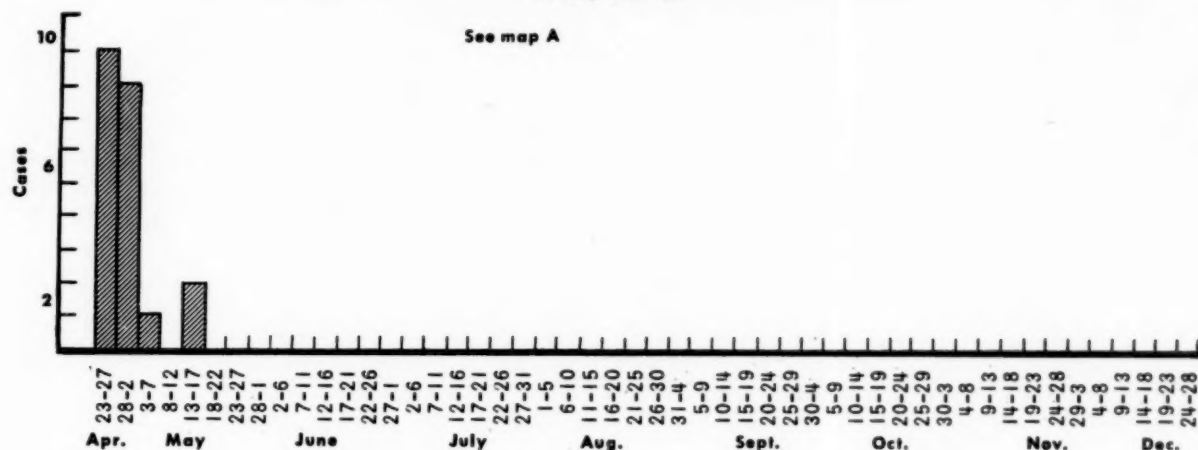
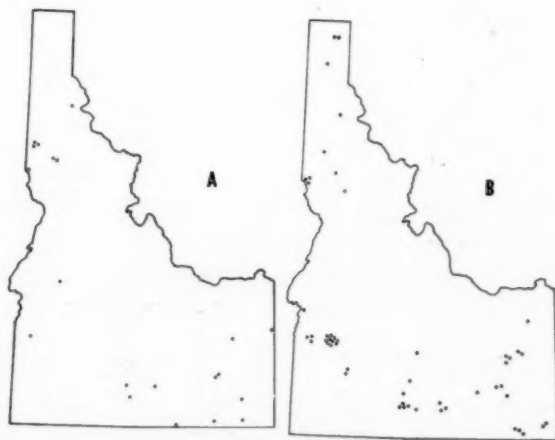
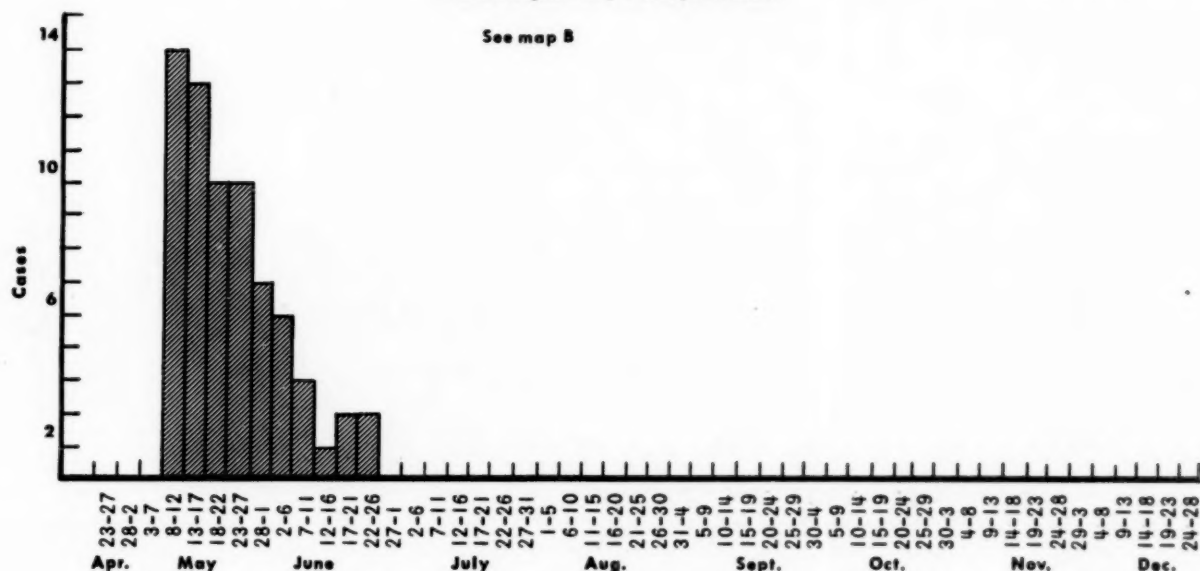


Figure 2. Poliomyelitis, type 1 and probable type 1, among contacts of children vaccinated on or after April 17, 1955, Idaho.



paralysis appears. Although no specimens were received from 25 paralytic patients, the majority of these cases were considered to be due to type 1 virus since so few type 2 and type 3 poliovirus were isolated from patients in Idaho during 1955.

Poliomyelitis occurred in 20 children who received vaccine, in 61 persons who were contacts of vaccinated children, and in 86 individuals who did not have a history of contact with vaccinated children or who had onset of illness during July or later. When onset was after July 1, 1955, the time lapse since vaccination

was so long that it appeared unreasonable to attribute the illness to contact with a vaccinated child.

Results

Epidemiological and clinical evidence showed a relation between the injection of poliomyelitis vaccines and the subsequent occurrence of poliomyelitis. Vaccination was begun April 17 and was practically completed within 5 days. Poliomyelitis was first reported in vaccinated children (fig. 1) in various scattered areas throughout the State (fig. 1, map A). These cases were followed by another group of cases (fig. 2, map B) limited to contacts of inoculated children. The geographic distribution of the two groups was similar. Although considerable effort was made to detect other types of poliovirus, only type 1 was isolated from these patients.

In 12 of 17 children with paralytic disease, the first evidence of paralysis was seen in the inoculated arm. In one child, the first signs, which developed on the 18th day after vaccination, were those of bulbar involvement and weakness of neck muscles. Of the 10 cases occurring within a week after administration of vaccine, 9 had onset of paralysis in the inoculated arm and 1 in a leg. In 5 of the 9, the disease progressed to bulbar poliomyelitis, and 1 child developed symptoms of severe encephalitis.

Initial involvement of an upper extremity with rapid progression to the opposite extremity and respiratory muscles was so unique clinically as to suggest that host response to poliovirus was influenced in some unusual manner. Equally striking was the lack of evidence of infection in members of patients' families when onset was less than 7 days after administration of vaccine.

Specimens were submitted from 31 family contacts (14 children) of the 7 children with onset on the fifth and sixth days after inoculation, but virus was not detected in any family contact nor was a rise in antibody titer demonstrated. Virus was first isolated from a family contact when the incubation period was 7 days. In two instances, virus was not recovered from family contacts when the incubation period was as long as 10 days. Usually,

proliferation of poliovirus takes place in the upper and lower digestive tracts before the central nervous system becomes involved, and the person is eliminating virus before symptoms recognizable as poliomyelitis occur. Furthermore, members of the family usually are found to be carrying poliovirus in their intestinal tracts by the time the initial case of poliomyelitis is diagnosed. However, in the vaccinated children in Idaho, virus apparently did not reach the intestinal tract until after the appearance of signs pointing to disturbances of the central nervous system. This observation and the fact that poliovirus was not recovered from family contacts of seven patients indicated an unnatural spread of the virus.

Several observations suggested that live poliovirus was present in the two lots of vaccine used: the time relationship of cases to the administration of vaccine, the wide geographic distribution, the frequent occurrence of initial paralysis in the inoculated arm, and the absence of evidence of poliomyelitis infection in the families of patients in whom there was a short interval between inoculation of vaccine and onset. Therefore, attempts were made to determine the amount of such virus in these lots.

By using cortisone-treated monkeys, all three types of poliovirus were isolated from each lot of vaccine. The available amount of one lot was insufficient to permit repeated attempts to isolate virus, but sufficient vaccine of the second lot was available for such tests. With this lot, the maximum number of monkeys infected with types 1, 2, and 3 poliovirus, respectively, was 4 of 10, 3 of 10, and 2 of 7. The maximum number of inoculated monkeys paralyzed in any experiment was 4 of 7.

Treatment of poliovirus with 1:4,000 formaldehyde at 37° C. for several days must produce many complex changes in the viruses, and any attempt, with present knowledge, to determine the amount of virus in such a preparation must represent only a crude estimate. Detailed findings of experiments in monkeys with these vaccine lots will be given in another report.

Reactions to the Three Viruses

Approximately 32,000 children received vaccine in the school program during April 1955.

So far as can be determined, about the same amount of each of the two lots was used. A diagnosis of poliomyelitis was accepted in 20 of these children (an attack rate of 62 per 100,000); 17 of them suffered paralysis (a paralysis attack rate of 53 per 100,000), and 4 died (a rate of 12 per 100,000).

Although the paralytic attack rate was high for such a widely scattered population, it was much below that observed in some outbreaks of poliomyelitis spread by natural means among populations with a previous history of poliomyelitis. In Minnesota during the summer of 1952, the paralytic attack rate among children of comparable ages was 182 per 100,000, and the death rate was 17.2 per 100,000.

In addition to clinically recognizable poliomyelitis, minor febrile illnesses occurred among children who received the vaccine. However, since vaccination was carried out at a time when respiratory illnesses were prevalent, it was difficult to relate minor illness to the use of vaccine. Approximately 20 percent of 649 vaccinated children complained of minor illnesses that occurred 1 to 2 weeks after vaccination. The illness consisted chiefly of headache, fever, general aching, and occasionally sore throat, nausea, or vomiting.

A relationship between these minor illnesses and the administration of vaccine was suggested when the antibody titers of the group with the minor illnesses were compared with those of vaccinated children who did not become ill. Since 6 percent of the children in each group did not possess antibodies to any type, they are excluded in this analysis. Children with minor febrile illnesses had a significantly greater proportion of type 2 antibody titers of 1:64 or less than the group without illness.

Type 2 antibody titers were distributed among 144 vaccinated children with minor illness and 463 children with no illness in the following manner:

	Minor illness (percent)	No illness (percent)
1:256 or greater.....	36	53
1:64 or less.....	64	47

In the group with type 2 antibody titers of 1:256 or greater, 37 percent had an anti-

body titer of 1:256 or greater for all 3 types; 85 percent for 2 types, and 15 percent for 1 type only. The corresponding figures for the group with a type 2 antibody titer of 1:64 or less were 0 percent, 25 percent, and 50 percent. Approximately 25 percent had a high type 1 antibody titer alone, 25 percent a high type 3 antibody titer alone, and 25 percent both type 1 and type 3 antibodies in high titer. These findings suggest that among individuals who had had no previous experience with type 2 virus, infection with type 1 or type 3 virus might be associated with the symptoms of a minor febrile illness.

That type 1 virus may have been more important than type 3 virus in causing minor illness is suggested by an examination of the group of serums with type 2 antibodies in a titer of 1:256 or greater. Eighty-one percent of the group with minor illness had type 1 antibodies in a titer of 1:256 or greater, whereas 65 percent of the group with no illness possessed such titers. This difference is statistically significant ($P=.022$) and suggests that type 1 infection even in the presence of high type 2 antibody titer may at times cause minor illness. A significant difference was not found in the proportion of high type 3 antibody titers between the two groups.

Many minor illnesses apparently were not caused by infection with a poliovirus since 18 children with minor illnesses either had no antibodies or had antibodies for 1 or 2 types of virus in a titer of 1:8.

Contacts of Vaccinated Children

In 61 instances of poliomyelitis, a history of contact with vaccinated children was obtained. Children under 15 years of age and women were chiefly affected (table 2). Multiple cases occurred in some families. In 56 instances a vaccinated child, usually with no recognized illness, appeared to be the source of infection. Poliomyelitis was diagnosed in only 2 of these vaccinated children and 4 others manifested symptoms of a minor febrile illness.

The number of days from the vaccination of a child suspected to be a carrier to the onset of illness in the 61 contact cases is given in table 3. This period was less than 45 days in 54 instances. When greater than 64 days, a history

Table 2. Age and sex distribution of cases of poliomyelitis among contacts of vaccinated children, Idaho, 1955

Age (years)	Paralytic		Nonparalytic	
	Male	Female	Male	Female
0-4	9	14	1	2
5-9	8	2	2	1
10-14	3	5	2	1
15-19	0	1	0	0
20-24	0	1	0	0
25-29	0	3	0	0
30-34	1	3	0	0
35-39	1	1	0	0
Total	22	30	5	4

NOTE: Three cases, in females aged 6 and 36 and a male aged 36, were fatal.

Table 3. Time of onset after vaccination of cases of poliomyelitis among contacts of vaccinated children, Idaho, 1955

Days after vaccination	All cases	Cumulative totals	Type 1 virus from suspected source	Cumulative totals
16-19	6	6	4	4
20-24	13	19	6	10
25-29	11	30	6	16
30-34	8	38	5	21
35-39	8	46	1	22
40-44	8	54	5	27
45-49	1	55	1	28
50-54	3	58	1	29
55-59	1	59	1	30
60-64	2	61	0	30

of association with vaccinated children was much less frequent, and a carrier other than a vaccinated child was considered to be the source. Periods as short as 16 days between administration of vaccine and onset of illness in an exposed person were observed, and in 6 instances the period was less than 20 days. Such short intervals between vaccination and onset in a contact suggest that several cycles of infection could take place within a 60-day period. It is therefore possible that some of the 61 so-called contact cases are not the result of exposure to the suspected vaccinated child but represent a cycle of infection further removed. It was impossible to designate a definite period during which contact cases could be attributed only to exposure to a vaccinated child.

Cases of poliomyelitis that occurred in Idaho later than 64 days after the vaccination program was terminated were arbitrarily classified as secondary cases. Type 1 poliovirus was isolated from 2 vaccinated children with whom poliomyelitis patients had had intimate contact, but the time of onset was 81 and 83 days, respectively, after vaccination. Whether these children were carrying virus from the time of vaccination or had become infected subsequently is uncertain.

If cases having a history of association with vaccinated children and onset within 64 days after the time of vaccination are accepted as contact cases, a carrier rate of 178 per 100,000 is obtained.

Other Associated Cases

Poliomyelitis occurred in 86 persons whose contact with a vaccinated child did not appear to be the source of infection but in whom type 1 poliovirus was shown to be the cause, or most probable cause, of illness. As shown in figures 3-5 and table 4, the disease occurred in some of these at the same time as it did in those having intimate contact with vaccinated children. Usually, however, onset was so long after the time of vaccination that poliomyelitis due to exposure to a vaccinated child did not appear probable.

As noted in figures 3-5, 19 cases occurred during each of the three 30-day periods from July 1 to September 28, but the number then fell to approximately 7 during the 30-day periods between September 29 and December 28. Probably these cases represent at least the third cycle of infection following the use of vaccine, since they began to appear immediately following the occurrence of known contact cases and occurred in areas where vaccinated children developed poliomyelitis.

Twelve poliomyelitis patients, 11 paralytic and 1 nonparalytic, were admitted to Idaho hospitals from adjoining Malheur County, Ore. Type 1 poliovirus was isolated from nine patients. Onset of the first case was August 24; of the last, October 28. An adjacent Idaho area, in which several cases of poliomyelitis occurred, is a trading center for the Oregon county. It appears possible that these patients

Figure 3. Poliomyelitis, type 1, among persons with onset after July 1, 1955, or with no known contact with children vaccinated on or after April 17, 1955, Idaho.

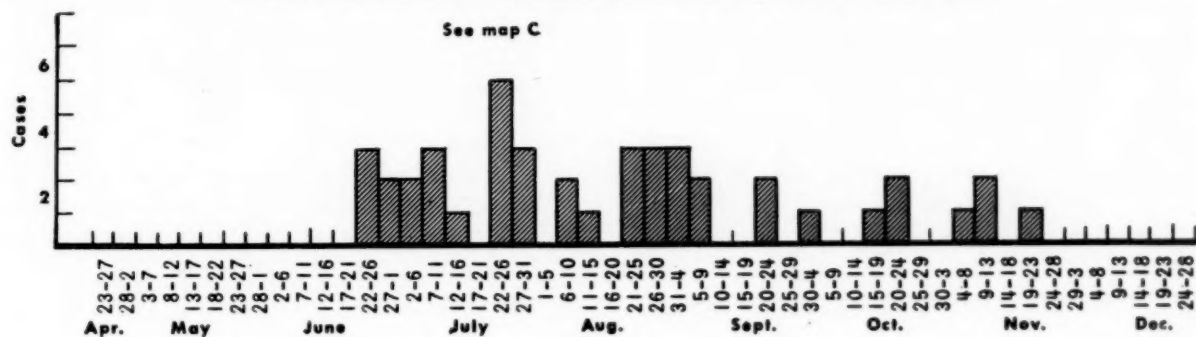


Figure 4. Paralytic poliomyelitis cases with type 1 antibodies and onset after July 1, 1955, or without contact with children vaccinated on or after April 17, 1955, Idaho.

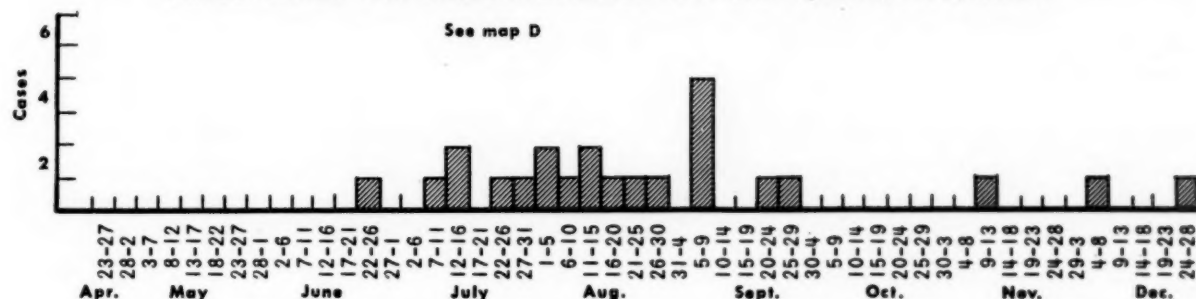
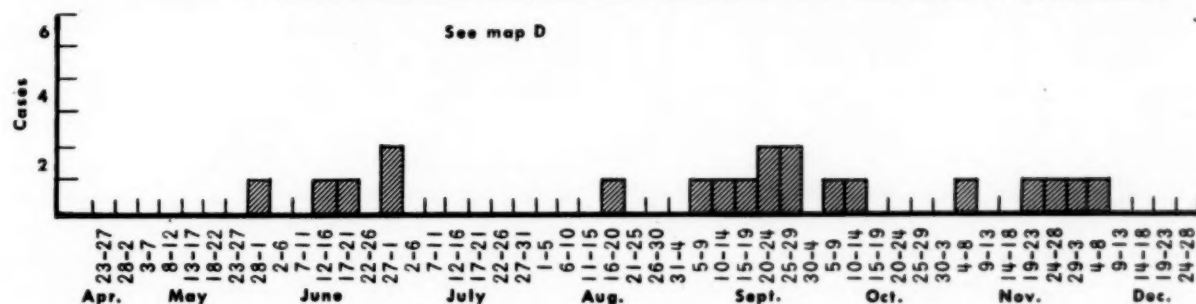


Figure 5. Paralytic poliomyelitis cases, for which no specimens were received, with onset after July 1, 1955, or having no known contact with children vaccinated on or after April 17, 1955, Idaho.



may have been exposed to poliovirus from Idaho cases.

Detection of Types 2 and 3

Type 2 poliovirus was not isolated from children receiving vaccines in Idaho or from their immediate contacts. However, type 2 virus was isolated from the family of a child whose paralytic disease began July 5 and from one patient with nonparalytic poliomyelitis with onset August 23. Serologic studies of 6 other patients with paralytic poliomyelitis showed significant antibody titers for type 2 virus. In

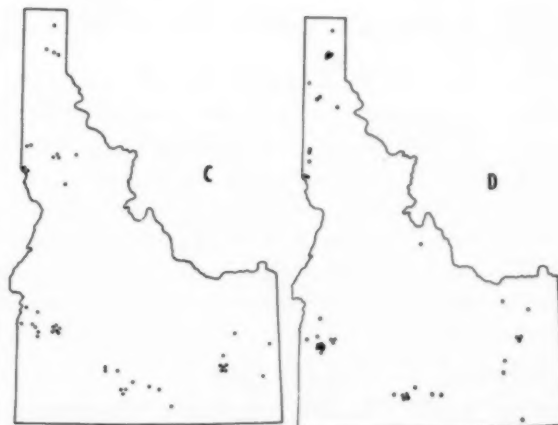


Table 4. Age and sex distribution of poliomyelitis cases unassociated with vaccinated children, Idaho, 1955

Age	Type 1 virus isolated				Type 1 antibodies, paralytic		No specimen, paralytic		Total
	Paralytic		Nonparalytic						
	Male	Female	Male	Female	Male	Female	Male	Female	
0-4	10	8	0	2	1	0	5	0	26
5-9	6	5	1	1	1	2	2	1	19
10-14	1	2	1	1	0	2	2	1	10
15-19	2	0	0	0	3	1	1	0	7
20-24	0	2	0	0	0	3	0	1	6
25-29	1	0	0	0	3	2	1	3	10
30-34	0	0	0	0	2	2	1	0	5
35-39	0	0	0	0	0	0	0	1	1
40-44	0	0	0	0	0	0	0	0	0
45-49	0	0	0	0	0	1	1	0	2
Total	20	17	2	4	10	13	13	7	86

3 of these persons, the onset occurred during July (fifth, seventh, and eighth), 1 during August, 1 during September, and 1 during October. Three patients (2 male and 1 female) were in the age group 0 to 9, 1 patient (female) in the age group 10 to 19, and 4 patients (1 male and 3 females) in the age group 20 to 24. It was not possible to establish that the vaccine was the source of infection in these instances (fig. 6).

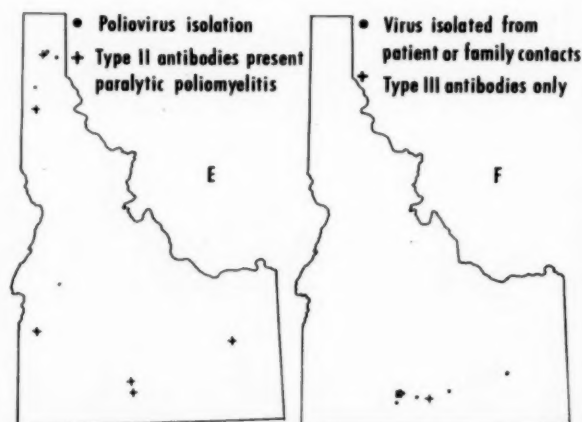
Although clinical poliomyelitis due to type 3 virus was not demonstrated in vaccinated children or in their intimate contacts, the possibility that minor illnesses resulted from injection of this virus cannot be excluded. A high neutralizing antibody titer for type 3 poliovirus and low or no neutralizing titers for the other two types of poliovirus were obtained from blood specimens of 21 children who gave a history of minor illness 6 to 8 weeks after vaccination.

Scattered cases of poliomyelitis caused by type 3 virus occurred in Idaho late in the summer. On nine occasions, diagnosis was established by isolation of virus either from patients or from members of the patient's family. In addition, only type 3 antibody was found in the serum of one paralytic patient from whom virus was not isolated. In this group of 10 patients, 4 had onset in July, 4 in August, 1 in September, and 1 in December (figs. 6 and 7). The earliest date of onset was July 9.

Five patients (3 male and 2 female) were in the age group 0 to 9, 3 (1 male and 2 female) in the age group 10 to 19, and 2 males in the age group 25 to 34. The sex and age distribution, the time of onset, and the geographic distribution did not suggest a connection with use of the vaccine.

Antibody Levels

During the vaccine study conducted in late 1955 and early 1956, blood specimens were obtained from 480 nonvaccinated individuals, chiefly children, and the levels of antibodies against specific types of poliovirus were determined at the Rocky Mountain Laboratory (table 5). Since the antibody level for type 1 poliovirus was less than 1:8 in 53.5 percent and was 1:1,024 or greater in only 1.2 per-



cent of these children, a limited spread of type 1 virus during the summer and fall of 1955 is indicated.

The antibody titers of blood specimens from children who had received vaccine in 1955 and from those who had served as controls in vaccine studies in Idaho in 1954 were compared for each of the three types of poliovirus. Although titrations of the 1954 serums were performed in the poliomyelitis evaluation laboratory at the University of Oregon Medical Col-

lege, Portland, the data are considered to be roughly comparable. More children in the 1955 group had titers of 1:1,024 or higher against each of the viruses, whereas a lower proportion had a serum titer of less than 1:8 (table 5). Since serums of approximately 30 percent of the children vaccinated in 1955 had no appreciable titer against type 1 and type 3 viruses, these children apparently were not infected by the amount of viruses present in the vaccines (table 6). Antibody responses to three doses of vac-

Figure 6. Poliomyelitis, type 2, after vaccinations beginning April 17, 1955, Idaho.

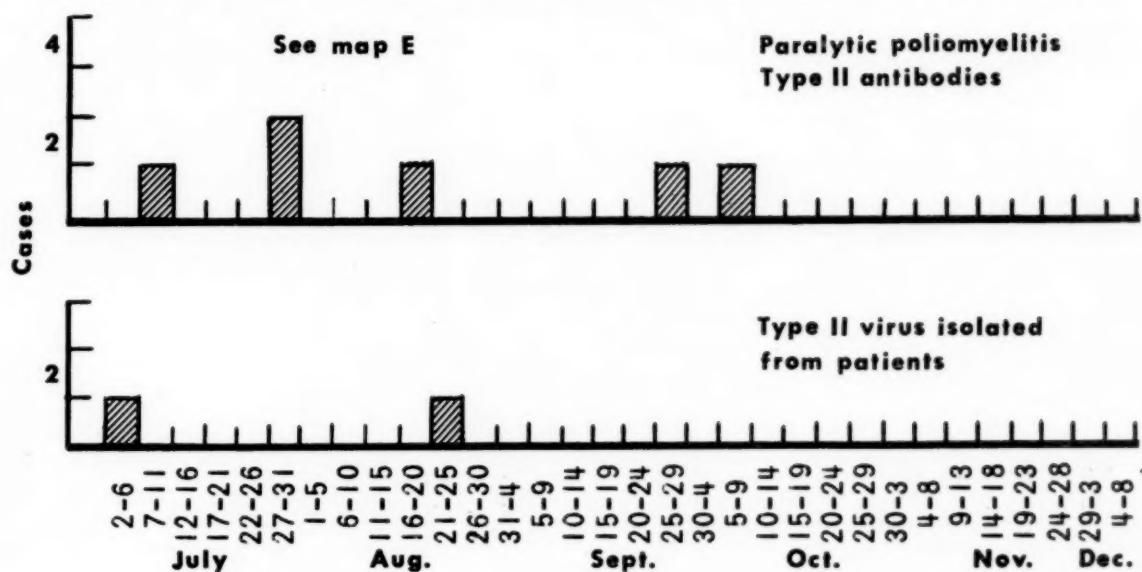


Figure 7. Poliomyelitis, type 3, after vaccinations beginning April 17, 1955, Idaho.

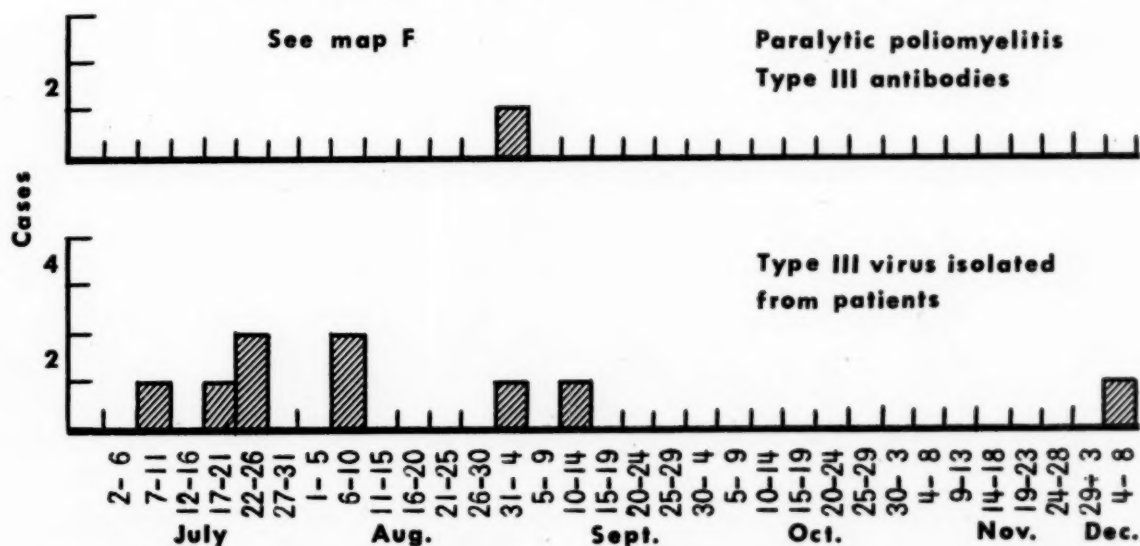


Table 5. Comparison of antibody titers of serums from children vaccinated in Idaho, 1955, with serums from nonvaccinated children

Category	Percentage of specimens with indicated reciprocals of titer							
	< 8	8	16	32	64	256	Total 8 to 256	1,024 or >
<i>Type 1 virus</i>								
Vaccinated 1955 ¹ -----	27	3	3	5	8	14	33	40
Nonvaccinated 1955 ² -----	54	3	3	7	19	13	45	1
Nonvaccinated 1954 ³ -----	46	4	9	-----	19	15	47	7
<i>Type 2 virus</i>								
Vaccinated 1955 ¹ -----	13	10	8	9	14	15	56	31
Nonvaccinated 1955 ² -----	65	2	2	3	8	12	27	8
Nonvaccinated 1954 ³ -----	59	2	6	-----	13	12	33	8
<i>Type 3 virus</i>								
Vaccinated 1955 ¹ -----	32	6	5	4	3	9	27	41
Nonvaccinated 1955 ² -----	48	2	5	7	20	13	47	5
Nonvaccinated 1954 ³ -----	54	1	13	-----	20	8	42	4

¹ 649 children vaccinated April 17-22, 1955; serums obtained June 2-14, 1955.

² Serums obtained from 480 children during late fall and winter 1955-56.

³ Serums obtained from 281 children, November 1954, in connection with the 1954 NFIP poliomyelitis evaluation study.

cine with "good" antigenicities reported in the 1954 study (3) and of vaccine used in Idaho in 1955 are compared in table 6.

Antibody distribution for children vaccinated in 1954 is well illustrated by the results obtained through neutralization of type 1 po-

liovirus (table 6). The discrepancy between the proportion of children having intermediate titers in the group vaccinated in 1955 and the proportion in the group vaccinated in 1954 is what would be expected from administration of live virus. Individuals either developed infection and as a result produced antibodies in high titer or failed to become infected and consequently produced no antibodies.

Table 6. Antibody levels after 3 injections of "good" vaccine lots in the 1954 poliomyelitis evaluation study of NFIP compared with those developing after a single injection of vaccine containing live virus

	Total number	Percent with titers 8 or <	Percent with titers 16 to 256	Percent with titers 1,024 or >
<i>Type 1</i>				
1954-----	1, 250	14	51	35
1955-----	657	31	29	40
<i>Type 2</i>				
1954-----	1, 250	7	60	33
1955-----	657	23	46	31
<i>Type 3</i>				
1954-----	1, 250	10	58	32
1955-----	657	38	21	41

Discussion

It is rather surprising that the intramuscular inoculation of a virulent strain of type 1 poliovirus, which was capable of spreading from person to person, did not give rise to a more severe epidemic. The population had a large number of susceptible individuals, as indicated by antibody studies before and after administration of the vaccine and by the past history of poliomyelitis in the area. Vaccine was given in the spring when the weather was cold, but type 1 virus was still present in the population later in the summer. Yet an increase in the incidence of poliomyelitis did not occur. Consequently, one must conclude that a simple relationship of virulence of virus to

immune status of a population and to season of the year is inadequate to explain the epidemic occurrence of poliomyelitis.

Strangely, viable types 2 and 3 polioviruses present in the vaccine did not cause disease in vaccinated children or spread to their contacts. This could be due to a lack of virulence of these viruses for human beings when given intramuscularly or to interference between strains when administered simultaneously to susceptible individuals. The presence in vaccinated children of high antibody titers for types 2 and 3 polioviruses, however, suggests that these strains proliferated. The absence of central nervous system disease due to infection with type 2 and type 3 strains demonstrates the inability of these strains to invade the central nervous system following intramuscular inoculation. In monkeys, these strains, particularly type 3, showed little ability to produce viremia or to proliferate in peripheral tissues, characteristics which may be related to absence of disease in vaccinated children. The type 1 strain, which was definitely virulent for children, frequently was isolated from blood and peripheral tissues of monkeys. A type 1 strain without these characteristics appears desirable for use in a vaccine.

Summary

In Idaho, with a population of approximately 600,000, two lots of poliomyelitis vaccine were used during April 1955 to vaccinate 32,000 children in the first and second grades. All three types of poliovirus were isolated from

these lots of vaccine. Poliomyelitis due to type 1 virus occurred in 20 vaccinated children and in 61 of their contacts. In addition, 86 persons developed poliomyelitis from possible contact with these two groups. Thus, 167 cases were associated with the use of these two lots of vaccine. Poliomyelitis due to type 2 or type 3 viruses was infrequent, and evidence relating infections with these types to the vaccine used was not obtained. The absence of a severe outbreak of poliomyelitis due to type 1 virus is noteworthy in view of the wide dissemination of a virulent strain of type 1 poliovirus throughout the State. Since the immunity of the population was rather low as indicated by the previous history of poliomyelitis and by the 1954 vaccine evaluation study, a more severe outbreak would have been expected. Factors in addition to virulence of a poliovirus strain and immune status of a population are yet to be discovered before the genesis of poliomyelitis outbreaks can be explained adequately.

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U. S. Medical Supply Stocks Surveyed

A survey of the Nation's supply of medical items essential to survival following nuclear attack is being conducted by the Public Health Service. With the cooperation of the pharmaceutical industry, more than 700 wholesale drug houses, surgical supply firms, and chain drugstore warehouses will be covered in the survey, which is part of a program set up by the Office of Defense Mobilization. Also participating in this program are the Business and Defense Services Administration of the Department of Commerce, the Federal Civil Defense Administration, and the Department of Defense.

Appraising Scientists And Their Jobs

RICHARD W. BUNCH

IN THE INTEREST of properly appraising the scientists in its employ, the Bureau of State Services, Public Health Service, has devised a system for reviewing research and development positions.

Anyone who has had experience in grading research positions has faced the problem of finding criteria for measuring the quality of performance, a factor which materially affects the grade of the position.

The usual standards of job evaluation and measures of workload and accomplishment may be difficult to apply. The number of the scientist's publications may be quite misleading because years of preliminary unpublished trials may precede consequential results. The scientist is inclined to believe that a position classifier not trained in his specialty cannot satisfactorily evaluate his job. These considerations caused the Bureau of State Services to seek a better method of classifying scientists.

The Bureau uses scientists of many professions and disciplines in helping States and communities prevent and control disease and maintain health. Its programs include control of venereal disease, tuberculosis, and other communicable diseases; heart disease; chronic illness and aging; dental public health; air pollution control; water supply and water pollution control; milk and food sanitation; radiological health; and international health. Often its scientific personnel, by the nature of their jobs, are isolated from colleagues or supervisors trained in the same disciplines.

To enhance the job status of these men and women, the Bureau in 1955 formed the Committee for Review and Evaluation of Research and Development Positions to appraise, within the framework of civil service regulations, individual scientists and their achievements. The

committee's reviews, repeated at intervals of approximately 2 years, cover all scientists in grades GS-11 and above in research and development positions.

Basic to the committee's evaluations is the concept that, in determining the proper grade and salary of such positions, it is difficult to separate the job and the incumbent. The scientist's background, experience, professional capabilities, and achievements cannot be disregarded. In research and development work, the individual tends to create the level of his assignment by the quality of his research contributions. The grading of such positions must necessarily be related to the qualifications the individual brings to the position as well as to the nature of his duties and responsibilities.

A scientist's peers, who are themselves leaders in a field, can best evaluate his work, the committee believed. Consequently, panels of 3 or 4 peers from Public Health Service bureaus, other Government agencies, universities, and private industry have been appointed to work with the committee. The committee, with the help of these panels, applies standards used in governmental and nongovernmental positions to classify salaries and recognize scientific achievement.

Within the Bureau, the committee and its various panels of specialists have reviewed approximately 150 positions, covering all civil service scientists engaged in research and development activities. These included 32 in bacteriology-microbiology, 24 in other biological sciences, 37 in chemistry, 39 in statistics, 12 in behavioral sciences, and 6 exempt positions as provided in the Public Health Service Act, section 208 (g).

In addition to recommendations on the pay levels and classification of individual scientists, these reviews have yielded valuable counsel on better utilization of scientific skills and the need for special training and changes in assignment to round out professional experience.

The committee's recommendations and supporting statements from the panels of professional peers provide the Bureau and division chiefs with an adequate evaluation of the contributions of staff members whose professional training may have differed from their supervisor's. And for the first time, scientists have

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Committee Members

Members of the Committee for Review and Evaluation of Research and Development Positions are Dr. Frederick J. Brady, program officer, Bureau of State Services, chairman; Dr. George H. Bradley, assistant chief, Communicable Disease Center; Dr. Keith H. Lewis, chief, Milk and Food Research Program, Robert A. Taft Sanitary Engineering Center; and Dr. Herbert E. Stokinger, chief toxicologist, Occupational Health Branch, Division of

Special Health Services. H. N. Meng, Division of Personnel, Office of the Surgeon General, serves as the committee's technical adviser; Lambert G. Longen, Executive Office, and Harold F. Eisele, Program Office, Bureau of State Services, are its staff assistants. Dr. John C. Cutler served as chairman prior to his transfer to the National Institutes of Health as assistant director, National Institute of Allergy and Infectious Diseases.

their work reviewed comprehensively by members of their own scientific discipline.

The results of the Survey of Attitudes of Scientists and Engineers in Government and Industry, conducted by the Committee on Engineers and Scientists for Federal Government Programs, may reflect significantly the Bureau's reviews. The survey found that 65 percent of the scientists in the Bureau were satisfied with their job classification, as compared with 52 percent of those queried

throughout the Federal Government. Fifty percent of the Bureau scientists, and only 37 percent of the entire Government, believed their positions offered sufficient opportunity for salary advancement.

The Bureau's system has strengthened its scientific research and development, provided program administrators with classification and utilization reviews suited to their organization, and assured the scientist of a technically broad appraisal of his job.

Research Grant for National Library of Medicine

The Council of Library Resources has granted the National Library of Medicine \$73,800 to study methods of improving bibliographic services through the use of mechanical equipment.

The primary aim of this research project will be to develop improved methods for the rapid and efficient publication of comprehensive periodical literature indexes in broad subject fields.

To accomplish this goal, new composition techniques based on an integration of photographic and data-processing equipment will be investigated.

If the project is successful, the resultant changes in format and manuscript preparation will be adopted with the 1960 issues of the *Current List of Medical Literature*.

Study of the Altro Health and Rehabilitation Services' program for rehabilitation of posthospitalized mental patients illustrates some requirements for evaluative research in mental health. Limitations imposed by control group designs and selective biases arising from the operation of the program are taken into account.

Evaluating a Rehabilitation Program for Post-Hospital Mental Patients

HENRY J. MEYER, Ph.D., and EDGAR F. BORGATTA, Ph.D.

INTEREST in rehabilitation services for posthospitalized psychiatric patients has been stimulated by an increase in release rates from hospitals, following introduction of drug therapies, and by wider recognition that family, employment, and other social conditions appear to affect successful adjustment in the community (1-4). This interest may be thought of as a counterpart to the even greater attention paid to preventive programs (5).

Whether programs are directed toward prevention or rehabilitation, claims for their efficacy inevitably raise the question of evaluation. In the interest of efficiency as well as economy, sound assessment of effectiveness is obligatory for those who promote these programs as contributions to mental health. The need for evaluative research is widely acknowledged (6). But evaluative research on a service program in the field of mental health is, as

Clausen has said, "so appealing and yet so hazardous" (7).

Because of the pressing need to evaluate programs in which much time, effort, and money have been invested, most studies fall short of the rigor expected of scientific research. This is understandable in view of the difficulties of evaluating complex, changing, and often experimental efforts. Studies of the staff's or clients' satisfaction with a program, subjective judgments about progress or change, case studies to illustrate success, and similar reports may contribute useful knowledge about the operations of a program and may be valid sources of insight and understanding. But it is of no help to the orderly development of scientific knowledge to accept these studies as demonstrations of success or failure when it is possible to attempt more rigorous research. The state of our ignorance and the means of overcoming it should be accepted so that we may proceed slowly, and often painfully, to gain secure knowledge of what is being accomplished. The conclusion that this is the way of progress in evaluative research has been recognized not only for programs directly concerned with mental health but also for related fields, such as social casework, prevention of delinquency, and education of parents (8-10).

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Many technical and practical problems are encountered when a rigorous evaluative study is attempted. This paper will not discuss them. Instead, we shall consider how certain decisions about the research design and how certain problems that arise in executing the research within an operating program restrict the interpretation of the findings. Using a recent effort to evaluate the effectiveness of a rehabilitation program for posthospitalized mental patients as an illustration, we shall examine in particular the limitations imposed on the definition of what is being evaluated.

The Altro Project

The specific rehabilitation program that was subject to our evaluative investigation was that of the Altro Health and Rehabilitation Services, Inc., located in the Bronx, N. Y.

For more than 40 years Altro has operated a sheltered workshop for tuberculous patients, and it has served cardiac patients for more than 6 years (11, 12). After extended periods of hospitalization, these patients come to the Altro workshop where they remain, on the average, about a year before they graduate. They work in a factory environment but with work pressures adjusted to their health rather than to the demands of production. The workshop is, indeed, a modern garment factory manufacturing uniforms for nurses and hospital gowns that are sold by a sales force on the competitive market. Patients are paid union scale wages at piece rates for goods produced. They are subsidized when necessary to permit them to remain in the rehabilitation program.

The patients are under close but unobtrusive medical supervision; they are provided with periodic health examinations and continuous convalescent treatment when required. All patients put in a full day, but the actual time each works is determined by his particular needs. Work and rest periods alternate in recognition of disability and the development of work tolerance. Supervisors in the factory and instructors in the office-training program are practiced in dealing with the special problems of posthospitalized patients and many are themselves graduates of Altro. Each patient is assigned a caseworker and other social services

are available such as vocational counseling, job placement, and educational assistance.

The program is intended to harden the patient so that his transition from hospital to demands of normal living will not be so abrupt as to threaten his recovery and precipitate rehospitalization. By letting patients test the limits of their capacities in its workshop, Altro hopes that its clients will learn to function independently in the community.

From retrospective studies there is evidence that Altro makes an effective contribution to the rehabilitation of tuberculous and heart patients (13, 14).

With the need of tuberculous patients for rehabilitation services decreasing, and with the cardiac program well established, Altro turned its interest to the inclusion of psychiatric patients. In 1953 Altro began a year of experimental collaboration with Hillside Hospital, a private mental hospital in New York City (15). Ten patients were referred to Altro by Hillside, and seven participated in the workshop. With this experience added to the years of serving other types of patients, Altro felt ready to extend its services tentatively to certain types of hospitalized mental patients from the more heterogeneous populations of State hospitals (16). It did so with the widespread encouragement of psychiatrists and other professional persons concerned with mental health. Indeed, throughout discussions of potential sources for the limited number of patients that Altro felt able to serve, the director of Altro was repeatedly assured that this sort of rehabilitation service was greatly needed in the psychiatric field and that there would be strong demand for it.

With such assurances, arrangements were concluded with the New York State Department of Mental Hygiene for exploring the value of this service to patients of its Bronx aftercare clinic. Financial support was obtained to extend Altro's program, and the Russell Sage Foundation gave financial assistance for an evaluation of this effort. In accepting such assistance, Altro committed itself to a control-group design as an evaluative requirement. The patients were to be assigned at random to the experimental and control groups. The research question could therefore be stated at the outset as fol-

lows: Given matched groups of patients, will those who receive Altro services show greater progress, by some criterion of successful rehabilitation, than those who do not receive such services?

Altro planned to accept about 80 psychiatric patients during the 2 years of the study period. These patients would at any given time constitute about 20 percent of the normal caseload of approximately 200 patients at the workshop.

Defining Experimental and Control Groups

A service program, such as Altro's, is in general oriented to practice rather than to scientific research, and the canons of scientific methodology frequently appear to contradict the canons of practice. Altro's acceptance of a control-group design was therefore a bold step toward rigorous evaluation. As decisions were made to further this design, however, it was necessary to make some of the implications explicit.

With a control-group design one is in a position to say whether or not a program makes a difference to some population, on the basis of some criterion, such as return to the hospital. A program of rehabilitation includes many factors that might affect the client's welfare. The Altro program offers medical care, casework, vocational training, and other services as well as its distinctive workshop. Unless these factors can be specifically identified so that their counterparts can be examined in the experience of persons in the control group, our conclusion must be framed in general terms. We could say that Altro's patients in general fare better than non-Altro patients. From the standpoint of the community, this might be called the potential impact of Altro. It leads to statements about what the consequences would be if all patients were provided the same services as Altro's patients.

This kind of conclusion is very useful. It would require, however, further qualification in terms of the expressly defined population of patients to which it could be applied. If experimental and control groups were drawn from the population of all ex-hospitalized patients, our conclusion would mean one thing. If they were drawn from a population of patients limited by

interest in Altro, by stated characteristics, or by other definitions, our conclusion would thereby be restricted. This may be illustrated by considering a number of possible definitions of the subject population that might (ignoring practical considerations) be applied in this study.

Patients who were released from mental hospitals could respond in at least the following four ways to invitations to enter the Altro program:

1. They could be uninterested and decline the invitation.
2. They could be interested, explore the possibility, and decline to enter.
3. They could be interested, explore the possibility, enter, and withdraw at some stage in the program before it had been completed.
4. They could be interested, explore the possibility, enter, and graduate.

Furthermore, patients responding at any of these levels would constitute a population all of whom had had at least some information about Altro, ranging from mere knowledge of its existence to full participation in it. Therefore a no-contact category is logically required. Of such, at least two subcategories must be recognized since the distinction between them might be relevant to rehabilitation: (a) those ignorant of Altro altogether, and (b) those who know of Altro's existence but have had no further contact with it. Knowing about Altro could result in such meaningful reactions as: Is Altro the kind of place for people like me? Is it good or bad that people want to help former patients?

Similarly, each of the successive levels of contact noted above might reasonably be expected to have some effect on the patient's rehabilitation. Would the patient view an invitation to Altro as supportive or threatening? If a patient declined an invitation to Altro would he be punished or rewarded? And so on.

Generalization would be limited to that level selected as the population from which experimental and control groups were chosen at random. If a no-contact comparison group were used, statements about the impact of knowledge of Altro plus subsequent contact would be permissible. If the population were defined as patients informed about Altro but with various levels of contact with it, generalization would be appropriate only at the specified level. If

we want to know what Altro achieves only through its treatment services, we would have to compare those who went through the program with patients who might have gone through if they had had the opportunity. Still undefined would be which of the many things included in the rehabilitation program produced given results for experimental cases as compared with control cases.

It is conceivable that the treatment experiences for the experimental group could be recorded in detail at all points after their selection. In this manner specific treatment efforts might be related to variations in the degree of success or failure observed after treatment. It would be necessary, however, to have similar detailed knowledge of the experiences of the comparison group. Some of the features of the rehabilitation program at Altro, sympathetic work supervision, for example, might well be present in the experiences of patients in the control group.

Similarly, the effectiveness of any one of the specific kinds of treatment services could be stated only if the method of assignment to receive different services was governed by a random rather than a selective procedure.

For this particular evaluation the population was defined as patients who accepted the invitation to enter the Altro program. Among such, the treatment and comparison groups were selected at random and our generalizations must apply only to this population. The point here is that the design limited generalization to a segment of the population that might provide the answer to the question: Is Altro effective in rehabilitating posthospitalized mental patients?

Defining Treatable Patients

Restrictions from another side limit generalization in evaluative research. Any given treatment or service program assumes a part of the answer to the question of its own effectiveness by directing itself to predetermined categories of patients. Thus it says, in effect, we will (or can) work better with one type of client than with another.

The "community function" of the agency draws the broadest boundaries; for example, to

serve the aged, the adolescent, the tuberculous, or the ex-mental hospital patient. Within these boundaries further criteria of inclusion or exclusion are explicitly or implicitly accepted. Adjectives modify the clientele: healthy aged, female adolescents, arrested tuberculosis cases, or ex-hospitalized schizophrenic patients, are acceptable for treatment.

Still further exclusions are made by defining the type of services available; for example, healthy aged who need a home, adolescent girls who are going to have out-of-wedlock babies, arrested tuberculosis patients who can be expected to return to work or housekeeping, or ex-hospitalized schizophrenic patients who need rehabilitation.

Finally, among those potential clients for whom the services are intended, agencies develop conceptions of clients who can be best served by their skills. The rationale for these conceptions rests on estimates of competence in practice based on professional training and experience. It accepts, indeed, an evaluative conclusion before the question of evaluation is posed for research.

Thus the question asked of evaluative research might be restated as follows: How successful are we with those clients we want to serve and think we can help? This is an entirely legitimate question but it is much more restricted than the question: How effective is our program?

Research operations that come to grips with this restriction must seek explicit criteria to define the subject population from the viewpoint of the service agency. In the Altro project, staff and consultants formulated these general criteria: Bronx residents, 20-40 years of age, admitted only once to a mental hospital for 3-24 months, having formal psychiatric diagnosis of dementia praecox. In addition, to protect the going workshop program and in the interests of the patient, clinical criteria were to be applied in interviews by a psychiatrist to eliminate those who were "too sick" (revealing disturbing or dangerous psychotic symptoms, physically incapacitated, addicted to drugs), those who were "too well" (not in need of rehabilitation), and those having "alternative plans" (employment, household duties). Cases that survived all these criteria would be avail-

able to Altro and hence the subjects of the evaluative research.

A conflict between voluntary and authoritarian programs of treatment becomes pertinent at this point. Most private agencies, Altro included, adopt a treatment philosophy that expects the client to "accept" or "want" help in contrast to a treatment philosophy that asserts what the patient "should" or "must" do or have done to him. For example, State mental hospitals get "permission" to administer shock therapies; private agencies seek "cooperation" and "acceptance" of casework by their clients. Without prejudging the success of these approaches, we point out that the compromise of these conflicting philosophies of professional responsibility injects an additional selective definition of the subject population in evaluative research. We can describe some of the effects of this selective process on the Altro project.

Of the total caseload of ex-mental hospital patients at the Bronx after-care clinic, about 18 percent qualified under the general criteria enumerated above. Of these, about 28 percent survived the clinical screening, constituting only about 5 percent of the general population of posthospitalized mental patients. This is the point at which treatment and control groups were selected and evaluation could be said to apply only to these patients. Analysis of these groups, selected at random, indicates that the two samples do not differ significantly at the time of assignment with respect to any known characteristics.

The pool of patients from which both experimental and control groups were drawn does differ from the population of ex-hospitalized patients meeting the general criteria. The clinical screening process tended to anticipate the kind of clients the agency might favor. Specifically, the group of "available" patients includes a disproportionate number of single, white, better educated persons who have a higher occupational status, and who live with their parental families.

Because the selection just described occurs before experimental and comparison groups are chosen, it may be said to be controlled, if follow-up and before and after measurements are applied to these samples. However, it cannot be

assumed that the process of selective bias will cease at this point.

The professional approach of those providing service tends to select patients of unknown characteristics among those available to receive treatment. The logic of evaluative research would require, without compromise, that those designated for treatment be given treatment; the values of social casework and rehabilitative practice tend to assume that treatment should only be given to those who would accept it. Practitioners often argue that they can be effective only with such patients although this is one of the key questions that evaluative research is supposed to answer.

Of the pool of patients available as experimental cases for the Altro project, about a third had no contact whatsoever with Altro, another third had limited contact with members of the staff, and the final third actually entered the workshop. If the latter group is considered to be the only one composed of cases subject to the rehabilitation program, it constitutes a selected population for which the principles of selection might be explored retroactively. If the individuals in that group differ from the control group, the differences may be attributable to selection and not to treatment. Comparing patients (*a*) who received treatment, (*b*) who had lesser contact with Altro, and (*c*) who were offered services but received none with the control group can provide a picture of how this selective process operated. We can attempt to match each of these sets of experimental patients with patients in the control group. But the rigor of random matching cannot be claimed except to assess the effect of being offered the opportunity to enter Altro.

Inspection of the consequences of the selective process suggests that those patients reaching the rehabilitation program proper tend to be of two types: (*a*) those rather highly motivated to accept the kind of casework help and vocational training Altro offers, and (*b*) those who accepted Altro largely because they seemed unable to make any other sort of adjustment to the world outside of the hospital. Naturally enough, Altro is likely to feel that it is successful with the former and unsuccessful with the latter.

Were it possible to draw experimental and

control samples from those patients who actually enter the workshop and who are therefore subject to the rehabilitation program, we could evaluate the program. Because this would require arbitrary denial of service to some of those who have already accepted it, such a design is difficult to execute even for the most willing operating agency. A more feasible alternative would be to require the agency to extend maximum effort to see that patients selected for the experimental group were brought into the program.

Defining Successful Rehabilitation

Whatever the experimental design, the definition of what constitutes successful treatment poses additional issues. These will not be considered in detail in this paper. Criteria for successful rehabilitation can range from "objective" measurements, such as permanent avoidance of readmission to a hospital, to clinical judgments about the level of mental health of the patients, with various indicators of adjustment in between.

Whatever criteria are used, the value of a study is enhanced if the experimental design requires impartial application of the criteria to experimental and control groups alike. It will not, to be sure, support general statements about effectiveness of a program unless a fairly inclusive range of criteria is offered. It is at this point that some theory of what the rehabilitation program is supposed to do for patients becomes indispensable. Theory about treatment of the mentally ill is in a state of flux today. Therefore evaluation studies should, in our opinion, always include indicators such as rate of readmission along with other criteria. Attention should be given as well to the duration of whatever effects are observed.

In the Altro study, hospital status 1 year after release is the primary criterion but, in addition, employment adjustment, presence and type of psychiatric care, and a judgment of the patient's current competence for managing are included in the followup interview. Brief before-and-after attitude tests have also been used.

Conclusion

If a research plan as promising as that reported here encounters such serious obstacles, is

it futile to attempt rigorous evaluative research that is so badly needed? We think not. Several kinds of contributions can be made, and their importance will be directly related to the rigor with which the evaluation was planned and executed.

In the first place, a description of the selective process is of crucial importance to the interpretation of evaluation studies, and this is seldom reported in the literature of mental health. Second, analysis of the results of well-designed evaluation studies, even when they fall short of full success, will contribute to an understanding of the service program with greater certainty and more appropriate caution. Furthermore, each carefully conceived effort to meet the requirements of valid evaluation will provide experience to enhance the next attempt.

We sought to make explicit some of the inherent requirements of evaluative research. The difficulties encountered in the Altro project should not discourage evaluative research; their identification is the first step toward overcoming them. But this report should encourage modesty in making claims for service programs in mental health. As more certain knowledge accumulates, we may expect these programs to become more firmly based and demonstrably more effective.

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technique

Use of Plastic Trays in the CF Test

The bureau of laboratories of the New York City Department of Health has found that transparent plastic trays are a practical and reliable substitute for test tubes in the Kolmer complement fixation test.

The bureau explored the use of plastic trays in an attempt to reduce the costs of syphilis serology without diminishing the quality of its work. Experiments determined that the Kolmer complement fixation test performed in one-half quantity in the wells of the plastic trays matches the results of the test tube procedure.

In a comparative study, 578 serum specimens were tested simultaneously in plastic trays and in test tubes, each test in duplicate. The readings on the two sets of tests were in agreement on 551 of the serums and in disagreement on 27.

Readings in agreement on the duplicate tests performed by each of the two techniques were:

Tube and tray tests	Serums
R, R-----	369
R, WR-----	1
WR, WR-----	3
NR, NR-----	169
A/C, A/C-----	9
Total in agreement...	551

Readings in disagreement on the duplicate tests performed by each of the two techniques were:

Tube test	Tray test	Serums
R, R----	R, A/C-----	2
R, R----	WR, WR-----	7
R, WR--	WR, WR-----	1
NR, NR--	WR, WR-----	6
NR, NR--	WR, NR-----	4
NR, NR--	NR, NR-----	1
R, R----	NR, NR-----	1
WR, WR--	NR, NR-----	1
WR, NR--	NR, NR-----	2
R, R----	A/C, A/C-----	1
NR, NR--	A/C, A/C-----	1
Total in disagreement...		27

The degree of reactivity was determined according to the following scale:

Reactive (R)=10 to 100 percent complement fixation.

Weakly reactive (WR)=5 to 10 percent complement fixation.

Nonreactive (NR)=0 to 5 percent complement fixation.

A/C=test and control show equal or nearly equal inhibition of hemolysis.

In performing qualitative complement fixation tests in plastic trays, now routine in the bureau's syphilis serology laboratory, serum is put into the wells with a 0.2 ml. pipette,

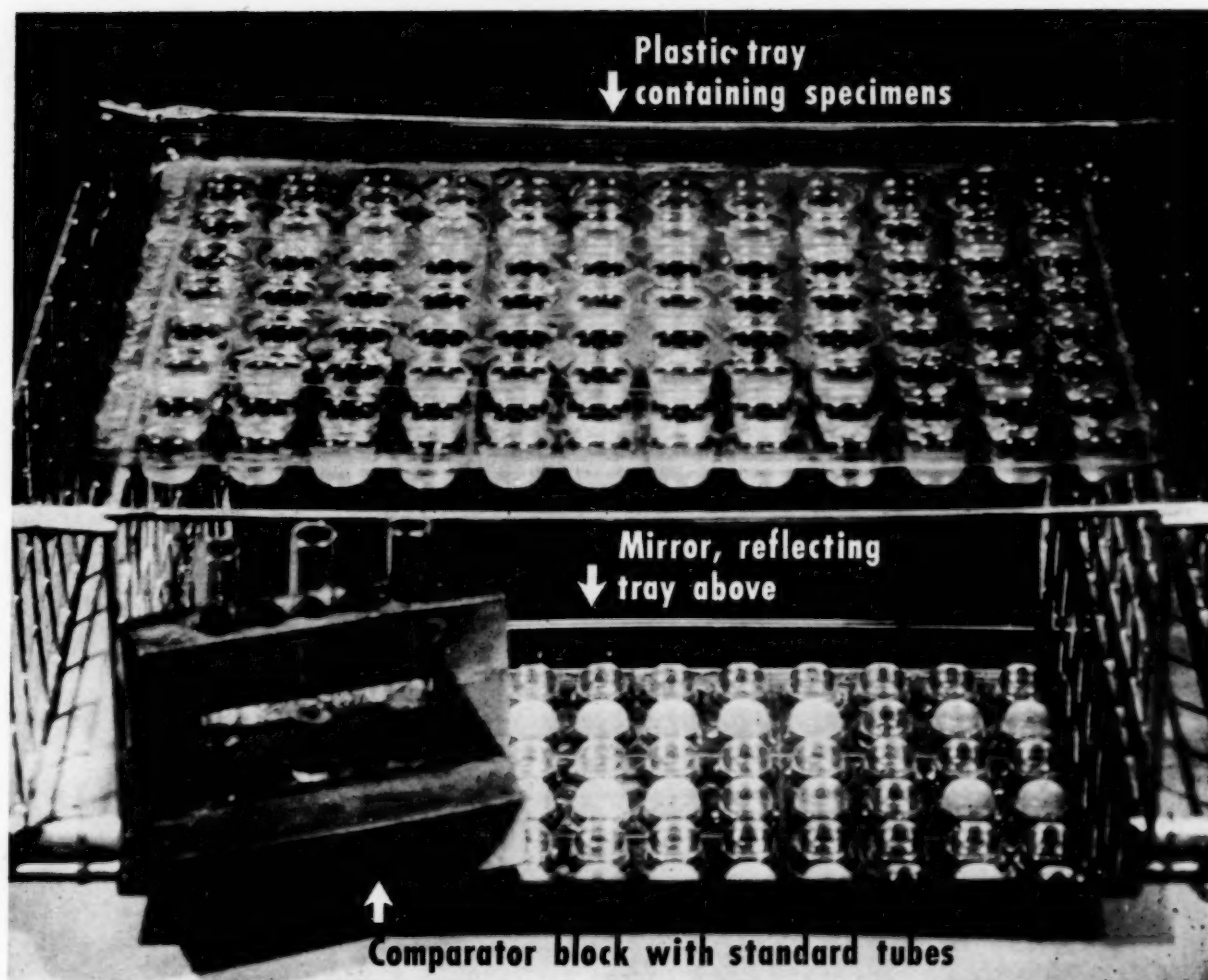
and reagents prepared by Kolmer's procedure are added with automatic pipetting machines calibrated to deliver 0.25 ml. and 0.5 ml.

Reagents and serums are mixed by holding the tip of the pipette sufficiently high so that the force of ejection agitates the contents of the well.

After the trays are filled, they are stacked on top of one another, with sheets of cardboard in between, and refrigerated. The contents are given primary incubation by floating the trays on the surface of a 37° C. waterbath; reagents are added; trays are again placed in the waterbath and are then placed on a rack to be read.

The rack supports the tray about 3½ inches above a plate glass mirror reflecting the bottom of the tray to facilitate reading. A fluorescent bulb desk lamp, placed about 8 inches above the tray, shines directly through it.

Reading controls are prepared according to Kolmer's procedure. Reading standards are made by adding 1.5 ml. of 0, 5, and 10 percent standards to 75- by 12-mm. Kahn tubes. Serums with questionable reaction are transferred to Kahn tubes and compared directly with the standards. The comparator block



facilitates direct comparison (see figure).

When the test is finished, the trays are easily cleaned by flushing them under a tap, rinsing them in distilled water, and air drying.

One thousand specimens, formerly requiring 2,000 Kolmer test tubes, are now tested in 21 trays, each costing 47 cents. Each tray can be used at least 6 times, representing a cost of about 8 cents for 48 specimens.

Use of one tray is equivalent to the handling of 96 test tubes for refrigeration, incubation, and reading. In our laboratory, 500 complement fixation tests were performed by one technician utilizing the trays.

A tray, containing 48 specimens, can be read at a glance. The technician's hands are thus free while reading, enabling him to record results without clerical assistance.

Without sacrificing quantity, the

plastic tray technique permits use of one-half the quantity of reagent needed by the test tube method and effects a substantial reduction in the cost of personnel, refrigerator space, and cleaning facilities.

—DANIEL WIDELock, Ph.D., ANNA D. REYNOLDS, JOHN TRUELOVE, and EVELYN V. ENGELKE, *bureau of laboratories, New York City Department of Health.*

A broken sewer line and an improperly designed automatic lawn sprinkling system, which permitted bayou water to enter the city's main, led to 72 cases of enteritis in Shreveport, La.

An Epidemic of Enteritis Laid to Cross-Connection

FLOYD M. MILLER and
BEN FREEDMAN, M.D., M.P.H.

THE INCREASING use of water by a modern household for its many appliances increases public health hazards related to the water supply. The creation of more cross-connections, backflow connections, and open connections to accommodate these appliances and devices demands that sanitarians remain vigilant to prevent contamination of the water supply.

The misuse of one such device, an automatic lawn sprinkling system, led to contamination of the city water supply, resulting in an epidemic of enteritis in Shreveport, La.

In the summer of 1947, Mr. X installed a pump in Bayou Pierre, which flows behind his property, to supply water to the sprinkling system for the rear lawn of his home. His property is located in the southeastern area of Shreveport, the wealthiest residential section of the city.

In 1953 Mr. X installed for his front lawn an underground sprinkler system which drew its water from the city supply. This sprinkler system having been laid out in conformity with Shreveport's plumbing code, Mr. X applied to the city for a tap and meter for the system.

In June 1954, Mr. X installed an automatic time clock system and a booster pump in his

yard to use the bayou water for his whole sprinkler system. At the same time, he replaced the pump in the bayou with another of 10-horsepower capacity. He thought that the automatic timing system prevented a cross-connection. When the front sprinkler was connected to the bayou water system, the bayou water was not completely cut off from the city water main. Only a manually operated valve intervened between the city system and the bayou water system for the front lawn. This setup maintained a pressure in the sprinkler line of 65 pounds. Apparently, however, the pressure in the city water main at this point was at no time greater than 58 pounds.

Unfortunately, no inspection by the city plumbing inspector was requested. Mr. X's yardman, not knowing the hazard, opened the valves from the city water supply to prime the booster pump and left them open. Thus, when the time clock set the system into operation every 24 hours, water from both the bayou and the city main was forced through the system at the same time. Water from the bayou was probably forced into the city main for a fairly long period, since the two gate valves were found in the open position.

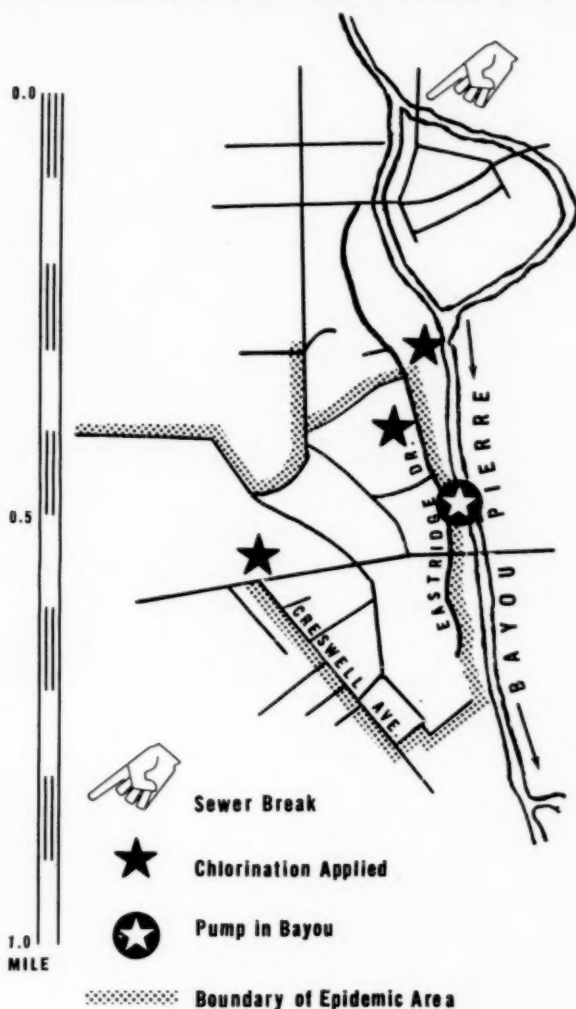
The Investigation

On August 7, 1956, a broken sewer line just off Bayou Pierre, about one-half mile from Mr. X's pump, was reported to the health department (see map). Investigation on August 8 revealed that the sewage from the broken line was draining into the bayou, and that the break had occurred about the beginning of August. Previously, the bayou water was fairly clear.

On August 8 the sewer break was corrected. The same day, the office of Shreveport's commissioner of public utilities received a call from a resident who said that the hydrant water in

Mr. Miller is chief sanitarian of the Caddo-Shreveport Health Unit and Dr. Freedman is director of the division of preventive medicine, Louisiana State Department of Health.

Site of enteritis epidemic in Shreveport, 1956



his house appeared green. An investigation was made, but the health department was not notified.

On August 11 a neighbor of Mr. X phoned the Caddo-Shreveport Health Department, stating that he, his wife, and his children were sick. He said there was a rumor that the water was bad. A sanitarian was immediately sent to the address to collect some water samples. The health department had no knowledge prior to this call of anything amiss with the city water supply. Because of the broken sewer line and the characteristics of the water, it was thought that sewage entering the bayou at this point was contaminating the water supply in the area.

On August 13, the water samples showed that heavy coliform contamination was entering the city water supply in the area where the com-

plainant lived. Eleven sanitarians went there immediately and began a search up and down the bayou for a possible cause of the bayou water entering the city supply. Within 2 hours they located Mr. X's pump in the bayou.

Some dye was put into the pump line to ascertain if the material would eventually reach the city main. The dye was detected shortly afterward in all the outlets in Mr. X's yard and in the city fire hydrant across the street.

As soon as there was proof of a direct connection between the bayou water and the city main, Mr. X was advised of the situation and asked to discontinue the use of the pump. He complied immediately.

The city water department severed the cross-connection and disconnected the water main from Mr. X's property. The contaminated line was flushed with clean water, and a heavy chlorine solution was allowed to remain in the line for a day or two. This procedure was repeated on several occasions, water samples being taken after each flushing. Beginning August 13, the sanitarians collected more than 300 water samples in the vicinity of the affected area and kept a continual surveillance of the water lines for chlorine residual. The people in the area were advised not to drink the water or else to boil it before use.

On August 14, health department nurses made a house-to-house canvass of the affected area for more epidemiological information. They found that approximately 70 persons had developed enteritis. The symptoms, similar in most cases, were nausea, vomiting, abdominal pains, tenesmus, and diarrhea, the latter bloody in some cases.

In laboratory examinations of stool specimens of some patients, *Salmonella infantis* was isolated from 1 specimen, *Salmonella panama* from 1, and *Giardia lamblia* from 2. *Salmonella oranienburg* was isolated from 1 water sample.

The local health officer and other physicians who attended patients made a diagnosis of dysentery on clinical evidence. Because of the danger of infectious hepatitis, gamma globulin was obtained from the Louisiana State Department of Health to administer to those who had been ill.

On August 23, none of the water samples

were positive. The water supply was officially declared safe for use 5 days later.

Analysis of Data

The data collected showed that 40 females and 32 males developed enteritis. Most of the cases occurred in children under 10 years of age, and in adults 35 years of age and over; only 2 were in infants. The total of 72 cases, none fatal, occurred in 27 households whose population was approximately 125. The attack rate, therefore, was about 60 percent.

Fifty-six of the cases occurred between August 9 and 13. This suggests that a common agent and a common set of circumstances acted over a short period of time.

The cross-connection between the lawn sprinkling system and the public water supply may be considered as the initiating factor of the epidemic because of these circumstances:

1. All the cases occurred in households supplied by the water main contaminated by the cross-connection on Mr. X's property.

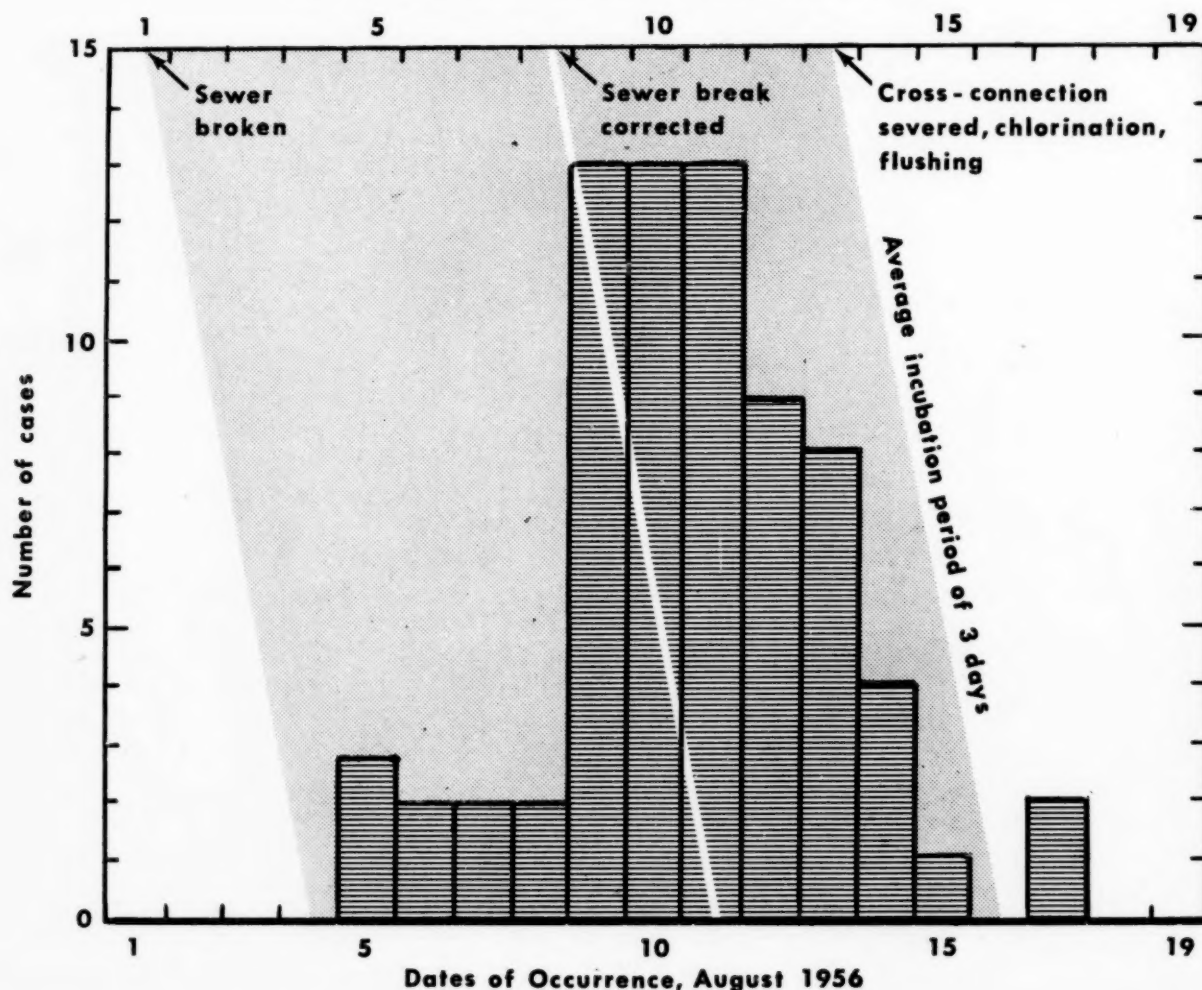
2. The bayou water was heavily contaminated because of the sewer break near Mr. X's property.

3. The dye test showed that the bayou water was reaching the city main in a relatively short interval.

4. The water pressure in the sprinkling system was greater than in the public water supply.

5. The gate valves in the sprinkler system

Occurrence of cases of enteritis in relation to incubation period, sewer break, correction, and beginning of control measures, Shreveport, La., 1956



line were frozen open, allowing the bayou water to flow into the public system.

6. The sewer break was corrected on August 8, and 3 days later the number of cases began to decrease.

7. The last primary case occurred 3 days after the cross-connection was severed and the water supply received increased chlorination.

In the neighborhood where the epidemic occurred, 206 water samples were taken from 69 residences. More than one sample was taken from most households; 62 of the samples were positive, 144, negative.

These results indicate that the contaminated water supply was the offending agent: among households with no cases, twice as many had all negative samples (30) as had at least one positive sample (16); twice as many of the households with cases had at least one positive sample (15) as had all negative samples (8).

All 16 samples taken on August 11 and 13 were positive for coliform bacilli. After chlorination was begun and the cross-connection was severed, 1 sample in every 4 was positive. This ratio later decreased to 1 in every 5, and after August 23 no more positive samples showed up.

Considering that the first cases occurred August 5 and the last two on August 17, the outbreak was probably caused by a stepped-up contamination of the water system beginning when the sewer line was broken (see chart). Since the buildup of contamination in the bayou water took several days, heavy contamination conceivably did not reach the property of Mr. X until August 6 or 7. With 3 days incubation for the offending agent, heavy contamination should have been reflected in a peak of cases about August 9; the actual peak was August 9-11.

The precipitous decrease in the number of cases began 6 days after the sewer break was corrected. This decrease is expected if we accept the premise of the incubation period and of dilution lessening sewage contamination in the bayou.

The epidemic apparently began to subside because the sewer line was repaired. But straggling cases may have been prevented by the later control measures, whose effect should have

been manifest by August 16. On that date, no new cases occurred (see chart).

The case distribution among families seems to indicate that none of those occurring up to August 11, the last day of the epidemic's peak, were family contacts. Of the 24 subsequent cases, 13 could have stemmed from family contacts, including the last 2, occurring on August 17 in households where other persons had enteritis about a week earlier.

No definite bacterial agent was isolated in stool examinations. The sequence of events, however, does fit the theory of an agent with a 3-day incubation period. The illnesses could also have been caused by a filtrable virus.

We must consider the possibility that the epidemic was caused by sewage intoxication. If this was true, then the epidemic should have ceased several days after the control measures were taken on August 13. For all practical purposes this actually happened (see chart). The plausibility of intoxications is partly affirmed by the fact that no definitive causative bacterial agents were isolated from stool specimens, although a viral agent remains a possibility. But if intoxication was the cause, then the presumption of contact cases is invalid.

The specific offending agent of the epidemic remains unknown. A bacterial source is possible, but a viral agent, a sewage intoxicant, or a combination of offending agents is also plausible. That the vehicle of transmission of the offending agent was the bayou water is quite clear, and that the offending agent was associated with the sewer break is circumstantially evident.

If more information on water supply hazards had been exchanged between the local public utilities department and the health department, action to control the epidemic would probably have been quicker.

The Official Response

As a result of these events, the Shreveport City Council adopted an emergency ordinance requiring that all sprinkler systems be registered with the city plumbing inspector, and the plumbing board urged that the plumbing code be enforced to the letter.

publications

Control of Silicosis in Vermont Granite Industry

PHS Publication No. 557. 1957. 65 pages. 40 cents.

Results of a study of the effectiveness of methods to prevent silicosis in the Vermont granite industry are described in this progress report. It traces early studies of silicosis in the industry and developments in engineering control of granite dust, describes the current silicosis control program, and presents findings of a re-study conducted in 1955 by the Public Health Service in cooperation with the Vermont Department of Health.

The report demonstrates that great strides can be made in national control of silicosis by properly applied medical and engineering measures.

Patients in Mental Institutions, 1955

Part I. Public Institutions for Mental Defectives and Epileptics

Part II. Public Hospitals for the Mentally Ill

Part III. Private Hospitals for the Mentally Ill and General Hospitals With Psychiatric Facilities

Part IV. Private Institutions for Mental Defectives and Epileptics

PHS Publication No. 574. 1958. Part I, 55 pages. Part II, 72 pages. Part III, 41 pages. Part IV, 26 pages.

Based on the 30th Annual Census of Patients in Mental Institutions, the ninth to be conducted by the National Institute of Mental Health, these publications present basic statistical data on the movement of the patient population of mental institutions in each State and in the United States.

The public institution and public hospital reports, parts I and II, con-

tain detailed tables on first admissions, resident patients, personnel employed, and expenditures for the care of patients. Parts III and IV carry data on the characteristics of first admissions to private mental hospitals and to private institutions for mental defectives. Statistics on the characteristics of discharges from general hospitals with psychiatric facilities are also included in part III.

Public Participation in Medical Screening Programs

A Sociopsychological Study

PHS Publication No. 572. 1958. By Godfrey M. Hochbaum. 23 pages; tables and charts. 15 cents.

Results of an intensive behavioral research study on determinants of voluntary participation in free medical screening programs are reported in this monograph. Although tuberculosis case-finding programs were used as source material for the study, the methodology and findings can be applied to screening activities in other disease detection programs. The findings relate to such factors as information, fear, socioeconomic level, and social forces. The study was sponsored by the National Tuberculosis Association and the Public Health Service.

Education, Training, and Utilization of Sanitary Engineers

National Academy of Sciences, National Research Council Publication. 1957. 17 pages.

Findings and recommendations of the Conference on Education, Training, and Utilization of Sanitary Engineers are summarized under three headings: career opportunities,

recruitment and recruitment incentives, and educational objectives.

The conference was held under the auspices of the Subcommittee on Personnel and Training of the Committee on Sanitary Engineering and Environment of the National Academy of Sciences, National Research Council in Washington, D. C., March 1957.

Copies of the report can be obtained from the Division of Sanitary Engineering Services, Attention: Engineering Resources Program, Public Health Service, Washington 25, D. C.

Births and Neonatal Deaths By Birth Weight: Reporting Areas, 1952-54

Vital Statistics—Special Reports. Selected Studies. Vol. 47, No. 1. Dec. 16, 1957. 19 pages; tables.

This is the second in a series of reports compiling comparative statistics on neonatal mortality by birth weight for States and cities. Vital records for 1952-54 served as a basis for the data, with information on mortality by birth weight obtained from certificates for matched births and neonatal deaths.

Distributions of births by weight and weight-specific neonatal mortality rates for white and nonwhite infants, as well as summary figures for prematures, are included in the data.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.